Vol. XX. DECEMBER, 1895. No. 12.

THE BOTANICAL GAZETTE

EDITORS:

JOHN M. COULTER, Lake Forest University, Lake Forest, Ill.
CHARLES R. BARNES, University of Wisconsin, Madison, Wis.
J. C. ARTHUR, Purdue University, Lafayette, Ind.

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[ISSUED DECEMBER 16.]

MADISON, WISCONSIN.
PUBLISHED BY THE EDITORS.

Tracy, Gibbs & Co., Printers, Madison, Wisconsin.

THE BOTANICAL GAZETTE

A Monthly Journal Embracing all Departments of Botanical Science.

ANNUAL SUBSCRIPTION, $3.00.

SINGLE NUMBERS, 30 CENTS.

The subscription price must be paid in advance. No numbers are sent after the expiration of the time paid for. No reduction is made to dealers or agents.

In Great Britain, 14 shillings.	In Germany, 14 marks.
Agents, WM. WESLEY & SON, 28, Essex st., Strand, London.	Agents, R. FRIEDLÆNDER & SOHN, Carlstrasse 11, Berlin, N. W. 6.

The prices named include postage.

Subscriptions and business correspondence should be addressed to the **BOTANICAL GAZETTE, MADISON, WIS.**; money orders and drafts should be made payable to the BOTANICAL GAZETTE.

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[Entered at the Post-office at Madison, Wis., as second-class postal matter.]

Contemplated changes make it undesirable to announce at this time the contents of the January number. That issue may be somewhat delayed if our plans are consummated. If not, it will appear at the usual time in the same form as during the past year.

THAXTER on DISPIRA.

HELIOTYPE PRINTING CO. BOSTON

BOTANICAL GAZETTE

DECEMBER, 1895.

Contributions from the Cryptogamic Laboratory of Harvard University. XXIX.

New or peculiar American Zygomycetes. I. Dispira.

ROLAND THAXTER.

WITH PLATE XXXIV.

Among the many interesting forms studied by Van Tieghem in his classic "Etudes sur les Mucorinées" [1] are several genera of doubtful affinities which this writer is inclined to consider hyphomycetous conditions of certain Ascomycetes. Of these, several named genera (Martensella, Coemansia, Kickxella) have been included in a family of Coemansiæ, clearly distinguished by their peculiarly differentiated sporophores and spores, and must still be considered *incertæ sedis*, although one of them has been not too definitely connected with an ascomycetous form. In addition to these, two nearly related genera are included in the same category, both parasitic on species of Mucor and distinguished by producing fertile heads which recall in some respects those occurring in Aspergillus or Sterigmatocystis: the one, *Dimargaris*, characterized by an erect solitary fertile hypha, terminated by a large spherical head from which arise compound sterigmata bearing spores in chains: the other, *Dispira*, producing also solitary erect fertile hyphæ which become distally several times dichotomous, the branches spirally twisted in a characteristic fashion and bearing numerous fertile heads associated with sterile horn-like branches.

Since the publication of Van Tieghem's paper the writer is not aware that this or any other species of Dispira has been observed. During the past spring, however, a package of rat dung was received by Mr. W. H. Rush, a student in the

[1] Annales des Sci. Nat. Bot. VI. 1: 153.

laboratory, who was the first to observe in cultures of this material a clear white fungus which on examination was found to be very similar to Van Tieghem's *Dispira cornuta* and was provisionally so named. The form was subsequently cultivated and studied more carefully by the writer and proved interesting not only from the fact that it appears to be quite distinct from Van Tieghem's species but was found in some instances to produce its sexual spores in abundance, thus determining beyond question its position in the system.

As described by Van Tieghem, *Dispira cornuta* is characterized by producing erect septate fertile hyphæ which become terminally symmetrically dichotomous, the same type of branching being several times repeated in planes successively at right angles to one another. Each successive branch is distinguished by a septum at its base and all become spirally twisted. The last formed are somewhat irregular, the ultimate divisions being either sporiferous or forming curved sterile horn-like branchlets. The fertile branchlet becomes terminally swollen into a spherical head from the surface of which bud out in all directions papillæ that subsequently develop into sterigmata. The sterigma consists of a single cell with a median constriction, or more commonly this constriction is replaced by a septum which divides it into two superposed cells, the upper of which bears terminally a single chain of six spores. The two main branches which are, in the younger condition, at first erect, and give to the fructification the appearance of a closed umbrella, gradually separate as they grow older, so that at maturity it becomes shaped like the letter T.

The American species, however, shows important differences in several essential points of structure, and although its general habit is similar, it is very evidently falsely dichotomous, one of the main divisions of the fertile hypha being a lateral outgrowth (fig. 2) below the base of the other, which is thus in reality a terminal modification of the primary axis. The same false dichotomy characterizes the secondary branching, although the resultant fructification, except for a certain asymmetry in its general habit, closely resembles its ally, showing the same characteristic spiral modifications and sterile horn-like ultimate branchlets. In addition to its usual asymmetry, the fructification differs in that it does not undergo the characteristic change of position above described. The

sporiferous heads, moreover, though similarly formed at the tips of ultimate curved branchlets, are clearly distinguished from the fact that the sterigmata are invariably two celled, the upper budding from the lower and not a result of septation, each cell bearing terminally several spore chains, or sporangia, if we adopt the terminology of Van Tieghem, each spore chain consisting of but two spores instead of six.

The characters of the non-sexual form of reproduction are of secondary importance, however, as compared with those of the sexual, which was not observed in connection with *D. cornuta*, but appears to be common in the American species and are quite without parallel among the Mucorineæ. The vegetative mycelium is composed of rather irregular branching hyphæ, for the most part aseptate and much smaller in diameter than the fertile ones. From these vegetative hyphæ are produced lateral branches which, becoming slightly swollen terminally, attach themselves usually to the fertile hyphæ of mucors. This lateral branch fixes itself firmly to the host filament by a sucker-like tip which eventually penetrates the host by means of an irregular protrusion, usually not conspicuously developed though sometimes extending a short distance beyond its point of entrance along the inner surface of the wall of its host. These suckers are the only parasitic organs which were observed in the material examined, and it is uncertain whether they are characteristic of the ordinary hyphæ or invariably represent the first stages in the production of zygospores, since they were always found associated with the latter.

The successive stages in the formation of the zygospores are illlustrated by figs. 10–13. The lateral branch already mentioned after it has fastened upon the host, becomes divided into two parts by a septum, usually nearer the filament from which it arises, and these two parts proceed to conjugate with one another, the outer becoming eventually separated from the parent filament and receiving from the inner the material derived from its parasitic union with the mucor. The outer gamete soon becomes nearly spherical, enlarging greatly to form the zygospore itself, while the inner, which gradually assumes the appearance of a mere outgrowth from the mucor, sends out simple or once-branched finger-like processes which grow about half way round the mature spore and are at first more or less yellowish from the

presence of the yellow oily material in the cell contents so often associated with zygosporic reproduction in mucors generally. As far as can be judged with a one-twelfth oil immersion there seems to be eventually a direct connection between the contents of the mucor hypha, and the supplying gamete. The finger-like outgrowths from this gamete become roughened by scattered and not very conspicuous prominences, and although they suggest the protective branches which surround the zygospores of *Absidia* or *Phycomyces*, do not seem to have any very definite function in the present instance, since they arise on one side only of the spore which they but half enclose. In general appearance they recall to some extent the characteristic parasitic attachments found in *Chaetocladium*, and might readily be mistaken for these organs, when, as sometimes occurs, a number of parasitic branches have attacked a mucor hypha in close proximity to one another, and the finger-like processes are developed in dense groups arising from what would at first sight be taken for a general distortion of the host, instead of a mass of partly coalescent supplying gametes.

The only case of conjugation among Zygomycetes, which seems in any way comparable to that which has just been described is found in the genus *Basidiobolus* Eidam, where the vegetative hyphæ become divided by septa into a series of cells which conjugate with one another as a result of the absorption of the septa separating adjacent cells, the contents of one such cell passing into the other and there forming the zygospore. In the present genus, as has been seen, the process is similar in that a parasitic branch divides into two cells which conjugate with one another, one being receptive, the other supplying; but apart from this circumstance the two types are not to be compared.

The close relationship which exists between the present genus and *Dimargaris* is evident from Van Tieghem's figures; in fact *Dispira Americana* corresponds far more closely in the details of its non-sexual fructification to the type of the first than it does to that of the last mentioned genus, and the discovery of additional species may necessitate the union of the two, their separation being at present based on a mere difference of habit. Among the Mucorineæ they may be provisionally included in the Cephalideæ, although perhaps sufficiently aberrant in their mode of sexual reproduction to form a group by themselves.

Van Tieghem has called attention to the septa of the fertile hyphæ in the present genus (which by an oversight were not inked in the accompanying illustrations before reproduction) and described the disc-like thickening for which they are remarkable. The same thickenings occur in *Dimargaris*, and, as was first noted by Van Tieghem, also in the second group of uncertain genera already referred to as constituting the family of Coemansiæ. It may be mentioned in this connection that the writer has cultivated certain of the latter forms *(Coemansia reversa, Kickxella alabastrina* and several others) on nutrient agar-agar in an absolutely pure condition some of them for a period of years, under various conditions, without ever having observed the production of any perithecia, and although Kickxella has been connected with an ascigerous condition, the evidence on which this connection is based is of the most unsatisfactory nature, and the reference of the group to the Hyphomycetes seems based on practically no reliable information. In the writer's opinion the peculiarities of the sporophores, the coherence of the gelatinous spore mass when ripe, together with the peculiarities of the septa just mentioned, as well as the general habit of these plants would indicate a connection with the Mucorineæ rather than with any other known fungi.

Dispira Americana, nov. sp.—Vegetative hyphæ slender branched, creeping on the substratum or running on species of *Mucor* to which they become parasitically attached, giving rise to single erect septate colorless fertile hyphæ which become terminally several times more or less regularly falsely dichotomously branched, the divisions spirally twisted, the curved ultimate branchlets either sterile or bearing terminally a white fertile head. Fertile heads spherical, producing numerous sterigmata which bud in all directions and consist of two superposed cells, the upper formed as a bud from the apex of the lower, each giving rise distally to several short spore chains of two spores each. Zygospores always formed in connection with a mucor filament, from one of two gametes without suspensors, nearly spherical, pale brownish, slightly roughened, partly surrounded by a rosette of slightly roughened finger-like processes from the supplying gamete. Fertile hyphæ about 1^{mm} high, 10–12μ in diameter. Fertile heads 35–45μ in diameter. Spores 3 × 1μ. Zygospores 35–65μ in diameter.

On rat dung from Greenville, Ohio (W. H. Rush), parasitic on Mucor.

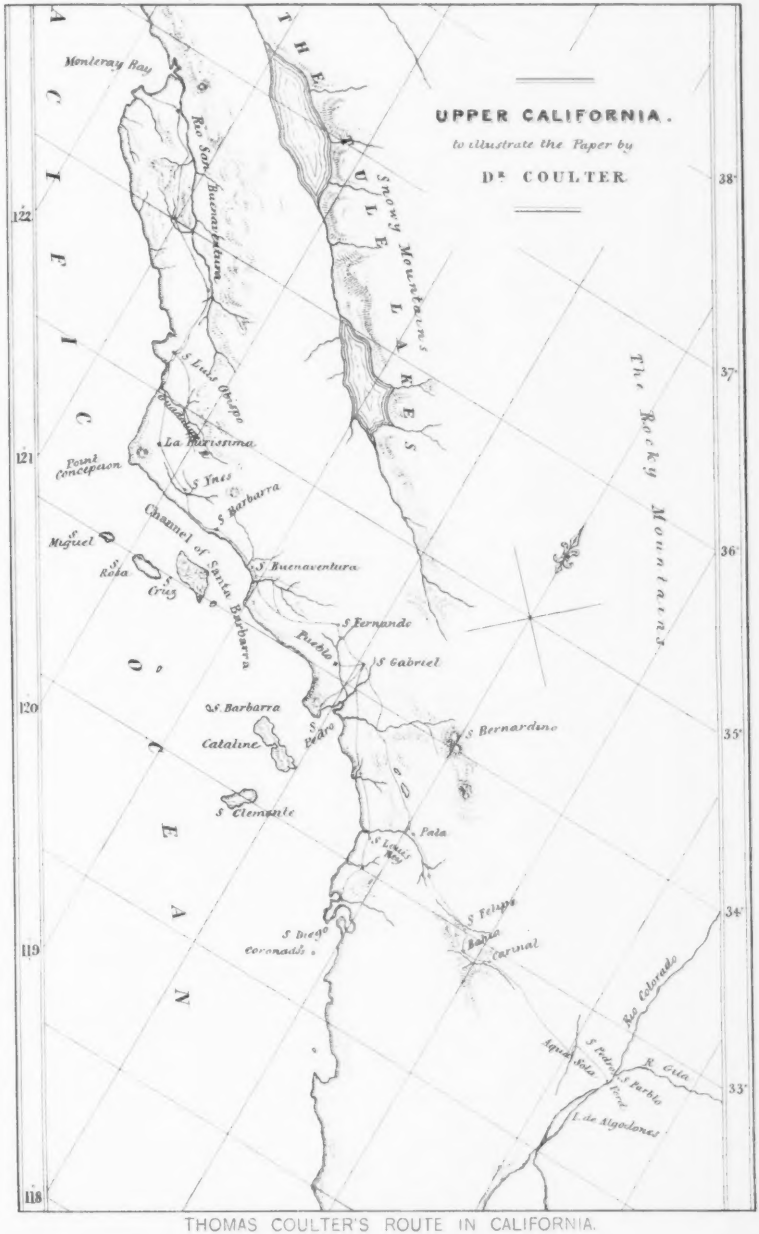
Harvard University.

Explanation of Plate XXXIV.

Dispira Americana Thaxter.

Fig. 1. Terminal portion of a small fertile hypha.
Fig. 2. A young fertile hypha showing false dichotomy.
Fig. 3–4. Fertile heads from which sterigmata are budding.
Fig. 5. Fertile head from which the terminal cells of the sterigmata have been formed by budding from the basal cells.
Fig. 6. Optical section of a fertile head showing mature sterigmata from which the spore chains are in process of budding.
Fig. 7. The same with nearly mature spore chains.
Fig. 8. Sterigma with two mature spore chains *in situ*.
Fig. 9. Two spores still adherent to one another.
Fig. 10. Fertile hypha of *Mucor mucedo* attacked by parasitic branches of Dispira which are producing zygospores in various stages of development.
Fig. 11. The same showing younger parasitic branches and zygospores more highly magnified.
Fig. 12–13. Two mature zygospores.

*** Note.—The original figures have been reduced by photo-lithography ⅓ and were drawn with the following approximate magnifications in diameters: Figs. 1, 2, 10, ×240. Figs. 3–9, ×925. Figs. 11–13, ×420.



THOMAS COULTER'S ROUTE IN CALIFORNIA.

The botanical explorations of Thomas Coulter in Mexico and California.

FREDERICK V. COVILLE.

WITH PLATE XXXV.

Among the botanical explorers in North America during the first half of the present century was Dr. Thomas Coulter, an Irish botanist, whose collections were the basis of important contributions to the descriptive botany of Mexico and California, but the details of whose life and route of travel are known only from the most fragmentary records. As illustrating the haze of uncertainty that surrounds the collections of Coulter I may cite the case of *Berginia virgata*. This acanthaceous genus with its single species was founded on Coulter's no. 603[1], accredited in the original description as "Californiæ incola." Later Dr. Asa Gray said of the plant, "not since met with; more probably collected in Arizona or within the borders of Mexico;"[2] and still later "probably Arizona: not since found."[3] In our inability, therefore, to ascertain an original station, the location of one of our monotypic genera was unknown for fifty years after it was first collected and finally when found in Sonora in 1884 by Mr. C. G. Pringle it was re-described by Dr. Gray as a new genus and species, *Pringleophytum lanceolatum*.[4] Had Berginia not become an essentially lost genus, from a lack of knowledge of the type locality, all this difficulty would doubtless have been avoided.

Thomas Coulter was born in the year 1793 near Dundalk, County Louth, Ireland,[5] and showed an early liking for out-

[1] Harv.; Benth. & Hook. Gen. Pl. **2:** 1096. 1876.

[2] Gray, Bot Cal. **1:** 588. 1876.

[3] Gray, Syn. Fl. **2**[1]: 327. 1878.

[4] Gray, Proc. Amer. Acad. **20:** 292, 293. 1895.

[5] See Proc. Roy. Irish Acad. **2:** 553-57. 1844. A five-page biographical sketch of Coulter is here given by his most intimate friend, the astronomer and physicist, Dr. John Thomas Romney Robinson, who invented the comm n cup anemometer and for whom Professor Harvey named the papaveraceous genus Romneya. This sketch seems to have escaped the attention of botanists, for neither Wittstein (Etymologisch-botanisches Handwörterbuch 233. 1856, [ed. 2]), nor Pritzel (Thesaurus Literaturæ Botanicæ 70. 1872), nor Hemsley (Biologia Centrali-Americana, Botany **4:** 125. 1887), nor Britten and Boulger (Journal of Botany **26:** 244. 1888) give either the place or the date of Coulter's birth.

door sports and natural history. He was prepared for college by Dr. William Neilson, author of a formerly well known Irish grammar, through whom he acquired an interest in the antiquities of Ireland. His education was continued at Dublin University where he showed marked proficiency in the mechanical and physical sciences and attracted particular attention for his knowledge of entomology and botany. His local collections of insects and mosses even at this time were large and valuable. In 1817 he was graduated with the degree B. A., and continuing his graduate work he took the degrees M. A. and M. B. in 1820.[6] He had already spent one or two summers in Paris, making there extensive collections of the plants of the Jardin des Plantes. After leaving the University he went to Geneva, where under the direction of DeCandolle he continued his botanical studies. He made a large collection of continental plants, compared them critically with DeCandolle's collections, and afterward, beginning in the spring of 1823, devoted himself to the elaboration of a monographic essay on the Dipsaceæ. The results of his investigations were published later in the year in his Mémoire sur les Dipsacées, an excellent work which, together with additional manuscript notes prepared in part at least at the herbarium of Delessert in Paris and communicated to DeCandolle in 1824, formed the basis for the elaboration of the Dipsaceæ published in the Prodromus in 1830.[7] The memoir was republished in 1824 by the Société de Physique et d'Histoire Naturelle de Genève. At the time of publication of his Dipsaceæ Coulter was already a Doctor of Medicine and a member of the Royal Irish Academy. This membership, which began March 16, 1819, he retained, as may be seen from the lists of members occasionally published in the Academy's Transactions, until his death.

In the year 1823 the Brazilian genus Coulteria of the Leguminosæ, now treated as a section of Caesalpinia, was named in honor of Dr. Coulter,[8] and the statement made that he was about to undertake an exploration in Chile. Returning to Ireland in 1824, he made preliminary arrangements for a trip to Argentina, Chile, Bolivia, California, and Mexico. He subsequently decided, however, to begin his travels with the

[6] These dates have been kindly furnished by Professor E. Percival Wright from the records of Dublin University.

[7] See A. P. DeCandolle, Prodr. **4:** 643. 1830.

[8] H.B.K. Nov. Gen. & Sp. **6:** 328. 1823.

last named country, accepting a position as medical attendant, or, as we should say, physician, of the Real del Monte Mining Company, under a three years' contract.

Coulter sailed from England in August, 1824, and doubtless reached Mexico in the same year, but the recorded details of his work there are very meager indeed. In a chronometric table given by Coulter in his Notes on Upper California are named certain localities in Mexico at which he took observations. The year unfortunately is not given, but the localities and partial dates are as follows:

Zimapan [state of Hidalgo] . . . . . April 8 to 15.
Mexico [city] . . . . . April 22 to 29.
R. D. Monte [Real del Monte, an old mining town in the state of Hidalgo, situated in the mountains about fifty miles northeast of the city of Mexico]. . . . . May 1 to 14.

In a meteorological table in the same paper Coulter cites from his journal certain temperature observations made, presumably by himself, at Veta Grande, a mining pueblo not more than ten miles north of the city of Zacatecas, in the state of the same name, from December 2, 1825, through the month of January following. Coulter, by reason of the desertion of some of his company's employees, was compelled to act, for more than a year, as superintendent of this important, and in his hands productive, mine.

After the termination of his engagement with the mining company, Coulter was located for a time at Hermosillo, a large town in the state of Sonora, on the river of the same name. His reference to this place is as follows:

"It [sometimes] freezes even to the south of Pitis [Hermosillo],[9] in lat. N. 29°; and in the winter of 1829–30, it froze in Pitis every night for nearly two months. On the 12th of December, on arriving at San Jose, a few leagues from Pitis [probably San Jose de Pimas, an old mining pueblo on the Rio Matare about sixty miles southeastward from Hermosillo], I found the thermometer at 18° Fahr., at 8 h. P. M. On the 13th, it stood in the shade below 32° all the day, at night sinking even to 18°. This, however, appears to occur very rarely."[10]

[9] On the maps of Humboldt and others to as late a date as 1840 this town was given variously as Pitic, Petic, and Pitit, but from the decade following that year the name Hermosillo appears on all the maps, though in Lippincott's Gazetteer these two names are not identified as belonging to the same town.

[10] Thomas Coulter, Notes on Upper California 69. 1835.

It is probable that Coulter passed through Guaymas on his way to or from Hermosillo, for two rare plants known only from the coastal flora at Guaymas, *Acacia willardiana* (Prosopis heterophylla) and *Perityle leptoglossa*, were in Coulter's collections, and many other species first brought to light by him have since been collected at that point.[11] It is known also from localities given by Hemsley in the Biologia Centrali-Americana for various plants collected by Coulter that he visited Jalapa, Guadalajara, Bolaños, Tepic, San Blas, and Mazatlan, all of which are well known as old mining towns or as sea-ports.

The first recorded news from Coulter, after his departure for Mexico, is furnished by DeCandolle, who in the year 1828 received from him a collection of fifty-seven species of living Cactaceæ, forty-seven of which DeCandolle immediately published as new, with no reference, however, to Coulter's movements.[12] Additional new species from this collection and remarks on his former descriptions were published by DeCandolle as a memoir six years later.[13] A similar collection of Cactaceæ, consisting of seventy species and varieties, was sent by Coulter to Trinity College, Dublin, for the botanical garden there in charge of Mr. James T. Mackay.

Of Coulter's work in California, after the termination of his travels in Mexico, we have much more satisfactory records. His headquarters were at Monterey. He reached that port, undoubtedly by sea and probably from San Blas, Jalisco, on the Mexican coast,[14] apparently in November, 1831; for David Douglas, writing to Dr. Hooker from Monterey under date of November 23rd in that year, stated that Dr. Coulter had arrived since he began the letter. These two botanists evidently worked together, to the great delight of Douglas, during the winter of 1831–2 and the following spring, Douglas finally sailing from Monterey to the Sandwich Islands and Coulter setting out on his trip to Arizona.[15]

As Coulter's journey from Monterey to the mouth of the Gila is the one with which the botanists of our own country are mainly concerned, it has seemed desirable to record in

[11] See Wats. Proc. Amer. Acad. **24**: 36–82. 1889.

[12] See note on DeCandolle's Revue de la famille des Cactées, below.

[13] See note on DeCandolle's Mémoire sur quelques nouvelles espèces de Cactées, below.

[14] C. C. Parry, Early Botanical Explorers of the Pacific Coast 6. (Reprinted from the Overland Monthly for October, 1883.)

[15] W. J. Hooker, Comp. Bot. Mag. **2**: 151–153. 1836.

some accessible place the details of his route. I therefore append suitable extracts from his Notes on Upper California and present also a photolithographic reproduction of a portion of the map issued with his paper. (*Plate XXXV.*)

[p. 60] "It will not be necessary to enter, at present, into much detail of my journeys in the country, of which the principal was that from Monterey to the junction of the Rios Colorado and Gila.

. . . . . .

[p. 63] "It would occupy too much time to go at present into any great detail of my travelling inland. I am tempted, however, to say a few words of the journey of which the principal [geographical] observations are [p. 64] given above, as it was the most interesting, the longest, and by far the most laborious of those I made in California.

"The rainy season of 1832 ended late in February, which is rather after the usual time, and I started so soon as the country was passable, which it is not at all during the rains, nor for some time afterwards. The rivers, which in the dry season are mere beds of sand, are quite impassable when swollen; and even for some weeks after they have fallen low, the danger and difficulty of crossing some of them, on horseback, are very considerable. If these streams carried down only sand, they might be passed as soon as the rapidity of the current was so far abated that a horse could stand; but the sand comes down mixed with a vast quantity of mud, which settles together with it; so that even when the stream becomes so low that a small animal can walk across, a horse or a man cannot. It is not until the mud is gradually washed out of the surface of the deposit that this becomes possible. We have then a bed of hard sand resting upon one of semi-fluid mud and sand; and it is very difficult to say when and where it is safe to attempt the passage. On this occasion I had to pass the Guadalupe [now the Santa Maria river, between San Luis Obispo and Santa Barbara counties], in this state, between San Luis Obispo and La Purissima;[16] and it was only after long search that I found a place where a bear had passed, and trusting to his sagacity I followed his steps. The stream was broad, very shallow, and the bed of clear sand on the surface of the deposit must have been very thin, for it swagged under foot like the surface of a quagmire. A body of troops which passed this way some days before, though on a most urgent affair, was obliged to wait for ten days to allow the sand to settle.

"From Monterey southward the road runs through a series of narrow ravines, as far as San Luis Obispo; but about Santa Ynez, south of San Luis, and again in the neighborhood of Santa Barbara, it runs on, or close by the beach; whence, southward, it keeps chiefly along the west foot of the mountains, separated from the sea by low sand-hills, in some places of considerable breadth, as at San Gabriel, where they are almost twelve leagues broad. The best way to the Colorado, in the dry season, is to follow the coast road as far as San Luis Rey, and

[16] The mission of La Purissima Concepcion, originally situated on the south bank of the Santa Inez river, about half way between Santa Inez and the sea, but in 1813–15 moved to a new site about two miles northeastward on the old wagon road between San Luis Obispo and Santa Inez.

thence ascend the Pala stream [San Luis Rey river], which runs in a very narrow ravine behind the maritime ridge, crossing the summit level between its head and that of the small stream of San Felipe [a stream heading in Warner pass, San Diego county], which runs southeastward till it reaches the border of the sand plain [the Colorado desert] at Carizal,[17] where it sinks; though its course across the plain, when swollen, which it rarely is, is marked by a dry channel, in many points of which a little water, usually very bad, is to be had by deep digging.

"There is not much difficulty in any part of the journey up to this point,—the Carizal; but from hence across the plain, which is here about one hundred miles broad, and totally destitute of [p. 65] pasture, cattle suffer extremely. It is always possible to carry water enough for a party of men; but horses and mules must pass the first two days absolutely without water or food,—and even then get only brine at the point called the Aqua Sola [probably the 'lagoons' at Alamo Mocho of the Pacific railroad reports and recent maps], from its being the only pond on the plain. When I passed, the water I found at this place was so strong that it purged both men and cattle. There is here some rush and reed which mules will eat, though horses usually refuse them.

"From hence there is still another day's journey to the Rio Colorado. After passing the river the same difficulties continue for seven days farther, on the Sonora road, as far as Alta; but this part of the journey, from its greater length, it is extremely imprudent to attempt without a proper guide.[18] The only water to be had is found in the ravines, frequently at some distance from the road, in excavations called Tinajas, made by the Indians, who were formerly much more numerous in this neighborhood than they are at present. . . .

[p. 68] "I shall not at present go into any examination of the vegetation of California, though this, as well as its fauna, is well worthy of the most attentive consideration. . . .

[p. 70] "I am sorry to be obliged to content myself with offering the Society so desultory and imperfect a sketch as this; but I have many claims on my time, the most urgent of which is the preparation of a work in some detail on the entire subject of California. Whatever is here defective will there, I hope, be found supplied."[19]

From certain chronometric tables, given by Coulter on page 61, in connection with his determinations of longitude, have been taken the following dates in his journey from Monterey to the mouth of the Gila in Arizona, all in the year 1832.

---

[17] According to Coulter's narrative, the Carizal is the sink of San Felipe creek. According to his map, however, it is on Carrizo creek, the next stream to the south, thus corresponding to the place known as Carrizo in the Pacific railroad reports and on recent maps. *Carinal* on Coulter's map is a misprint.

[18] It is clear from the dates of his itinerary and from statements in his article that Coulter did not at this time go on to Sonora but that he is here merely describing the road which might be followed into that country.

[19] See page 525 regarding the subsequent loss of his manuscripts.

Monterey . . . . . January 22 to March 20.
Santa Barbara . . . . . April 6.
San Gabriel . . . . . April 23.
La Pala [Pala, San Diego county] . . . . . April 30.
Ford [of the Colorado river, at or near the site of the present town of Yuma] . . . . . May 8 to 17.
La Pala . . . . . May 27.
San Gabriel . . . . . June 15.
Santa Barbara . . . . . July 5 to 7.
Monterey . . . . . July 19 to Aug. 2.

After further collecting in California, apparently always in the vicinity of Monterey, Coulter returned to Europe by way of Mexico, in the year 1834, bringing with him his collection of over 50,000 specimens, probably representing between 1,500 and 2,000 species, besides a collection of nearly 1,000 woods, botanical manuscripts, journal, and additional materials for a personal narrative. All these manuscripts were in some unaccountable way lost in transport between London and Dublin. Suffering from this loss, and broken in health from the hardships of his travels, he devoted himself thereafter quietly and unremittingly to the arrangement of his herbarium, which, with its total of about 150,000 specimens, became the property of Trinity College, he himself being appointed keeper, or curator. At the time of his death, in 1843, he had completed the arrangement of the European plants and had begun on his American collections.

The collections of Cactaceæ sent to De Candolle seem to have contained the only ones of Coulter's plants that reached an avenue of publication previous to his death, with the exception of five new Californian pines described in the paper by David Don, and the *Cupressus coulteri* of Forbes.[20] But Professor W. H. Harvey, upon his appointment as Coulter's successor, in 1844,[21] proceeded with the arrangement of the Californian and Mexican plants,[22] issued three short papers[23] on them, and, apparently in the years 1846 to 1848, distributed the greater part of the duplicates, the first set going to Kew and others to Dr. Asa Gray and Dr. John Torrey in America. The specimens were sent out under more than 1,700 numbers, unfortunately arranged systematically instead of chronologically.

[20] See bibliography and list of species below.
[21] Gray, Amer. Journ Sci. II. **42**: 274. 1866.
[22] [Anon.] Memoir of W. H. Harvey 147, 156. 1869.
[23] See bibliography, below.

I give herewith the titles of the special papers based on Coulter's collections, together with his own two publications, all chronologically arranged.

COULTER, THOMAS.

Memoire sur les Dipsacées. pp. 49. *pl. 2.* 4°. Genève, 1823.

Reprinted in Mém. Soc. Phys. de Genève **2²:** 13-60. *pl. 2.* 1824. The type pages in the two works are identical, with the exception of the page numbers and the signature marks. Page 44 of the original, immediately preceding the index, is blank, but in the reprint is filled by running the succeeding matter one page backward.

A revision of the family, preceded by a brief statement of the circumstances under which the work was undertaken and an elaborate morphological introduction.

DECANDOLLE, A. P.

Revue de la famille des Cactées. Mém. Mus. d'Hist. Nat. de Paris **17:** 1-119. 1828.

Pages 107 to 119 consist of a postscript, presented to the Société Helvetique des Sciences Naturelles at Lausanne July 22, 1828, based on a collection of fifty-seven species of living Mexican Cactaceæ received from Thomas Coulter while the paper was in press, and clearly the first lot of Coulter's Cactaceæ that came into De Candolle's hands. Forty-seven species were described as new, 25 Mamillariæ, 5 Echinocacti, 10 Cerei, and 7 Opuntiæ. Unfortunately no more specific locality than "Mexico" was given for any of the species, nor does the paper include any other reference to Coulter's collections, location, or movements.

DECANDOLLE, A. P.

Mémoire sur quelques espèces de Cactées nouvelles ou peu connues. pp. 27. *pl. 12.* 4°. Paris, 1834.

The half-title of his work is "Mémoire sur quelques nouvelles espèces de Cactées, et principalement sur celles envoyées du Mexique par le Docteur Coulter." It contains descriptions of three new species, two Mamillariæ and one Echinocactus, with critical notes on twenty-four others. Almost all this new matter is based on cultivated specimens from Coulter's first consignment in 1828.

COULTER, THOMAS.

Notes on Upper California. Journ. Roy. Geog. Soc. Lond. **5:** 59-70. 1835. With map.

A geographic account of California with a brief description and map of his route in 1832 from Monterey to the mouth of the Gila and return.

DON, DAVID.

Descriptions of five new species of the genus Pinus, discovered by Dr. Coulter in California. Trans. Linn. Soc. Lond. **17:** 439-444. 1836.

Describes *Pinus coulteri*, *P. muricata*, *P. radiata*, *P. tuberculata* and *P.* [*Abies*] *bracteata*, and gives a brief reference to Coulter's work in California.

HARVEY, W. H.

Description of a new genus of Papaveraceæ, detected by the late Dr. Coulter, in California. Lond. Journ. Bot. **4:** 73-76. *pl. 3.* 1845.

A description of the genus Romneya and its single species, *R. coulteri.*

HARVEY, W. H.

Characters of two new genera of Cruciferæ, discovered by the late Dr. Coulter, in California. Lond. Journ. Bot. **4:** 76-78. *pl. 4, 5.* 1845.

Describes the genera Lyrocarpa Hook. & Harv. and Dithyrea Harv. with the species *L. coulteri* Hook. & Harv. and *D. californica* Harv. respectively.

HARVEY, W. H.

Description of a new genus of Hydrophyllaceæ, from California. Lond. Journ. Bot. **5:** 311-12. 1846.

The genus Whitlavia described, with its two species, *W. grandiflora* and *W. minor*, both collected by Thomas Coulter.

The descriptions of most of Coulter's new species have come into the literature of botany irregularly and incidentally in various reports and monographs prepared at the great herbaria which received his collections, so that the complete collation of them would be a matter of great difficulty and probably not worth the effort. As indicative, however, of some of the avenues of publication, I append a list, chronologically arranged, of most of the species that bear his name, together with a few critical notes on other species regarding which mistakes appear to have been made.

Pinus coulteri Don, Trans. Linn. Soc. Lond. **17:** 440. 1836.
"Habitat in California, in montibus Sanctæ Luciæ, alt. 3,000–4,000 ped. *Coulter.*"

Cupressus coulteri Forbes, Pinet. Woburn. 190. 1839.
Publication not seen.

Romneya coulteri Harv. Lond. Journ. Bot. **4:** 75. *pl. 3.* 1845.
"In California boreali legit *T. Coulter*, 1832." Known only from the coastward side of the San Jacinto mountains in San Diego county.

Lyrocarpa coulteri Hook. & Harv. Lond. Journ. Bot. **4:** 76. 1845.
"In California legit *T. Coulter*, 1832. (No. 40.)" Since collected only in Sonora and Lower California.

Prosopis heterophylla Benth. Lond. Journ. Bot. **5:** 82. 1846.
"Sonora Alta, in Sonora, Mexico." Now called *Acacia willardiana*, and known only from Guaymas.

Prosopis pubescens Benth. Lond. Journ. Bot. **5:** 82. 1846.
"California between San Miguel [in the northern part of San Luis Obispo county] and Monterey." The plant does not occur in the region named, but doubtless came from the Colorado Desert, where it is a common and characteristic tree. Coulter passed through San Miguel, although he did not give the place a name on his map, on his trip from Monterey to the mouth of the Gila.

Antirrhinum coulterianum Benth.; A. DC. Prodr. **10:** 592. 1846.
"In California (Coulter)." Now known from the coastal side of the San Bernardino-San Jacinto mountain system of southern California.

Linum coulterianum Planch. Lond. Journ. Bot. **7:** 498. 1848.
"In regni Mexicani ditione Zimapan, *Dr. Coulter*, no. 758, in herb. Hook. a cl. Harvey comm." Considered by Mr. Hemsley a variety of *Linum schiedeanum* Ch. & Schl.

Dalea mollis Benth. Pl. Hartw. 306. 1848.
"In vicinibus Monterey [California] legit Coulter." This plant has not been rediscovered at Monterey, and as it is now known to be a species characteristic of the California-Arizona desert region the locality given by Bentham should be treated, as intimated by Dr. Sereno Watson, in the Botany of California, as incorrect. It was undoubtedly collected by Coulter in the Colorado Desert on his trip from Monterey to the mouth of the Gila.

Astragalus coulteri Benth. Pl. Hartw. 307. 1848.
"Juxta Monterey [California] legit Coulter." A species of the Colorado Desert, California, not known in the coastal region and undoubtedly attributed to that district by mistake.

Eunanus coulteri Harv. & Gray; Benth. Pl. Hartw. 329. 1849.
"In valle Sacramento." The description was drawn by Bentham from a specimen collected by Hartweg as above, but the name was borrowed

from unpublished manuscript of Harvey and Gray, based undoubtedly on one of Coulter's Californian plants.

Obione coulteri Moq. DC. Prodr. **13**[2]: 113. 1849.

"In California (Coulter! n. 687)." Supposed to be a plant of San Diego county, now referred to Atriplex, but not yet satisfactorily identified.

Pectis coulteri Harv. & Gray; Gray, Pl. Fendl. 62. 1849.

"California, *Coulter* (no. 330)." A desert species, undoubtedly collected on Coulter's trip to the mouth of the Gila.

Psilactis coulteri Gray, Pl. Fendl. 72. 1849.

"Mexico, *Coulter*, no. 295." Known now as a widely distributed desert species of southeastern California, Arizona, and northwestern Mexico.

Perityle leptoglossa Harv. & Gray; Gray. Pl. Fendl. 77. 1849.

From "Coulter's Californian collection." In Gray's Synoptical Flora **1**[2]: 321. 1884, the locality is given as "probably Arizona." It has been recollected at Guaymas by Dr. Edward Palmer, and Mr. Rose believes that the original specimens were collected in this region, not in California.

Cirsium coulteri Harv. & Gray; Gray, Pl. Fendl. 110. 1849.

"California, *Coulter*." Referred later by Dr. Gray to *Cnicus occidentalis* which is principally a coastal species.

Malacothrix coulteri Harv. & Gray; Gray, Pl. Fendl. 113. 1849.

"California, *Coulter*." A species principally confined to the desert region. In the original description the name of the species is cited from "Harv. & Gray, Pl. Coult. ined." indicating that a joint work on Coulter's collections was contemplated by Dr. Gray and Professor Harvey.

Oserya coulteriana Tulasne, Ann. Sci. Nat. Bot. III. **11**: 106. 1849.

"Nova Hispania.—(*Coulter*, no. 1,394.)"

Tauschia coulteri Gray & Harv.; Gray, Pl. Lindh. 2: 211. 1850.

No. 121 of Coulter's Mexican collection. Now *Arracacia coulteri* (Gray & Harv.) Coult. & Rose.

Menodora coulteri A. Gray, Amer. Journ. Sci. ser. II. **14**: 44. 1852.

"Mexico, Coulter (no. 938)."

Cleomella coulteri Harvey; Torr. in Gray, Pl. Wright. 1: 12. 1852.

Type locality not given. A *nomen nudum* for a plant now referred to *Wislizenia refracta* Engelm.

Kosteletzkya coulteri Gray, Pl. Wright. 1: 23. 1852.

"Sonora Alta, Northern Mexico, *Coulter* (no. 804)."

Hibiscus coulteri Harv.; Gray, Pl. Wright. 1: 23. 1852.

"Zimapan, Mexico, *Coulter* (809)." Description based also on the specimens of Wright and Gregg.

Acacia coulteri Benth.; Gray, Pl. Wright. 1: 66. 1852.

"(Zimapan, Mexico, *Coulter;* without any number.) Uplands of the Leona river, Western Texas [Wright]."

Bolanosa coulteri Gray, Pl. Wright. 1: 82. 1852.

"Bolanos, Northern Mexico, *Coulter*."

Brickellia coulteri Gray, Pl. Wright. 1: 86. 1852.

"California, *Coulter* (no. 293), in herb. Hook." From southern Arizona to adjacent arid portions of interior northern Mexico, probably collected by Coulter near Yuma where it has since been found.

Elaterium coulteri Gray, Pl. Wright. 2: 61. 1853.

"Zacatecas, Mexico, *Coulter*, no. 51." This is *Echinocystis coulteri* (Gray) Cogn.

Tetraclea coulteri Gray, Amer. Journ. Sci. II. **16**: 98. 1853.

"Mexico, *Dr. Coulter* (no. 1,172 in coll.).—Prairies of San Felipe and Live Oak creeks, Texas, *Wright*, 1849 (no. 462); also at Escondido Springs, in the same district, 1852. Azufrora, near Saltillo, Mexico, *Dr. Gregg* (no. 502). Saur de Cieñega, between Conde's Camp and the Chiricahui Mountains, on the borders of New Mexico and Sonora, *Wright*, 1851 (no. 1,513)." After the description of the genus the specific name is given, with citation of specimens as above but without a diagnosis of the species.

Guaiacum coulteri Gray, Pl. Thurb. 312. 1854.

"On hills between Rayon and Ures, Sonora; October, 1851 [Thurber's collection].—The specimens bear ripe fruit only. They are said by Sir William Hooker to accord with no. 779 of the Mexican collection of the late Dr. Coulter."

Salix coulteri Anders. Oefver. Kongl. Vet. Akad. Förh. **15:** 119. 1858.

"In California (*Coulter*) Hb. Hooker." Now united by Mr. M. S. Bebb with *S. sitchensis*, a species of the coastal region extending from Alaska at least to Santa Barbara, California.

Spigelia coulteriana Benth. Journ. Linn. Soc. Bot. **1:** 90. 1861.

"In Mexico ad Zimapan, *Coulter*, n. 962."

Decatropis coulteri Hook. f.; Benth. & Hook. Sp. Pl. **1:** 299. 1862.

"Mexicana." The name *D. coulteri* is cited without description, after the original description of the genus, as the only species.

Orthotrichum coulteri Mitten, Journ. Linn. Soc. **8:** 25. 1865.

"California, *Coulter*."

Conyza coulteri Gray, Proc. Amer. Acad. **7:** 355 1868.

"This is Coulter's no. 285 and 286 and has recently been collected near Fort Mohave [Mohave Desert] by Dr. Cooper."

Berendtia coulteri Gray, Proc. Amer. Acad. **7:** 380. 1868.

"Mexico, no. 1334, 1335, coll. Coulter, ex herb. Trin. Coll. Dubl."

Peperomia coulteri C. DC. in DC. Prodr. **16**[1]: 424. 1869.

"In Mexici prov. Zuinapa (?) [Zimapan] (Coulter n. 1400! in h. Kew)."

Nama coulteri Gray, Proc. Amer. Acad. **8:** 283. 1870.

" 'California' [perhaps Arizona], Coulter, 463. Nazas Valley, Bolson de Mapimi, Chihuahua, Mexico, Gregg." A desert species, not yet re-discovered within the borders of the United States. The brackets are in the original.

Caulanthus coulteri Wats. Bot. King Surv. 27. 1871.

"Southern California." A species not yet satisfactorily known.

Microsplenium coulteri Hook. f.; Benth & Hook. Gen. Pl. **2:** 4. 1873.

"In Mexici regione montana a Coultero et a Gal otti (n. 2704) lecta." As in the case of Decatropis the specific name is here cited without description.

Malvastrum coulteri Wats. Proc. Amer. Acad. **11:** 125. 1876.

"Collected probably in south-eastern California by Coulter (n. 96) and in the valley of the Gila by Schott, on the Mexican Boundary survey." A species of the desert region, now known as *Sphaeralcea coulteri* (Wats.) Gray.

Asclepias coulteri Gray, Proc. Amer. Acad. **12:** 71. 1876.

"Mexico, Coulter, coll. no. 983."

Leptoglossis coulteri Gray, Proc. Amer. Acad. **12:** 165. 1877.

"Mexico, coll. Coulter, no. 1346." Now *Nierembergia coulteri* (Gray) Hemsl.

Perezia coulteri Gray, Proc. Amer. Acad. **15:** 40. 1879.

"Gravelly slopes, near San Luis [Potosi?] flowering in spring and again in autumn. No. 547 [Parry and Palmer] in part. This is no. 234 of Coulter's Mexican collection, from Zimapan."

Sisymbrium coulteri Hemsl. Diag. Pl. Nov. 18. 1879.

"Mexico: in regione San Luis Potosi, alt. 6,000–8,000 ped., *Parry et Palmer*, 14; sine loco speciali, *Coulter*, 675."

Exostemma coulteri Hook. f.; Hemsl. Diag. Pl. Nov. 32. 1879.

"Mexico: Zimapan, *Coulter* 209."

Zaluzania coulteri Hemsl. Diag. Pl. Nov. 33. 1879.

"Mexico: Real del Monte, *Coulter*, 350."

Gutierrezia coulteri Hemsl. Diag. Pl. Nov. 33. 1879.

"Mexico: Zimapan, *Coulter*, 315."

Schoenocaulon coulteri Baker, Journ. Linn. Soc. **17:** 477. 1880.
"Mexico prope Zimapan, Coulter!"
Senkenbergia coulteri Hook. f.; Benth. & Hook. Gen. Pl. **3:** 6. 1880.
Original locality "North Mexico, Sonora Alta (*Coulter*, 1425). Hb. Kew", according to Hemsley, Biol. Cent.-Amer. Bot. **3:** 5. 1882. Referred by Dr. Watson to Boerhavia.
Helianthemum coulteri Wats. Proc. Amer. Acad. **17:** 323. 1882.
"At Zimapan (743 Coulter) and in the Morales Mountaines, San Luis Potosi (608 Schaffner)"
Calliandra coulteri Wats. Proc. Amer. Acad. **17:** 352. 1882.
"At Soledad (2129) [Palmer, 1879-80]; collected also by Coulter, without number or locality."
Marsdenia coulteri Hemsl. Biol. Centr.-Amer. Bot. **2:** 336. 1882.
South Mexico, Zimapan (Coulter, 970).
Echites coulteri Wats. Proc. Amer. Acad. **18:** 113. 1883.
"In the Sierra Madre, south of Saltillo (805) [Palmer, 1879-80]; 987 Coulter."
Verbesina coulteri Gray, Proc. Amer. Acad. **19:** 13. 1883.
"Zimapan, Mexico, *Coulter*, 341, 369."
Lasthenia glabrata coulteri Gray, Syn. Fl. **1**[2]: 324. 1884.
"Saline marshes, S. California *Coulter* (no. 338), *Brewer, Cleveland, Pringle.*"
Carex coulteri Boott; Hemsl. Biol. Centr.-Amer. Bot. **3:** 473. 1885.
"South Mexico, Zimapan (*Coulter*, 1620), Santa Fé, valley of Mexico (Bourgeau, 671)."
Philadelphus coulteri Wats., Proc. Amer. Acad. **22:** 472. 1887.
"Zimapan (77 *Coulter*); foothills of the Sierra Madre near Monterey, Mexico (*C. S. Sargent*, April, 1887)."

It is evident from Coulter's published work and from references to him in the writings of his contemporaries that he was not merely a collector but a botanist, a man of general culture, and an enthusiastic field naturalist and geographer. Regarding his personal characteristics Dr. Romney Robinson[24] says: "He had every requisite for success among half civilized or savage races: a noble and commanding person; great stature, strength, and dexterity in the use of arms; good temper, courage, and presence of mind: a combination of qualities, which Bruce only, of modern travellers, possessed in the same degree." Coulter was the first botanist who penetrated the Colorado Desert,[25] remarkable for the aridity of its climate and the peculiarities of its flora. His collections were very large, and their enumeration, had it been published in a single report, would have formed probably the most valuable contribution to North American botany ever issued. It is hoped that this effort to record an outline of his work will serve to show to some extent the importance of his scientific explorations to the advancement of botany in America.

[24] Proc. Roy. Irish Acad. **2:** 555. 1844.
[25] See W. H. Brewer in Watson, Bot. Cal. **2:** 555. 1880.

I earnestly request that any known facts regarding Thomas Coulter not included in this paper be communicated to me. These together with other matter, including the letters of Coulter to Augustin Pyramus and Alphonse DeCandolle, to which through the courtesy of Dr. Casimir DeCandolle I have recently had access, may hereafter be incorporated into a more detailed account of Coulter's labors.

Washington, D. C.

EXPLANATION OF PLATE XXXV.

The plate is a photolithographic reproduction, on the original scale, of the principal part of the map, which was itself a lithograph, published with Coulter's "Notes on Upper California." About an inch and a half was cut off the original at the top and bottom, neither portion containing any mark of Coulter's route.

Undescribed plants from western Mexico.

Collected principally by Frank H. Lamb in the winter of 1894–5.

MERRITT LYNDON FERNALD.

Kosteletzkya stellata, n. sp.—A slender much branched suberect plant, five to eight feet high, with the stems and branches densely stellate-pubescent: leaves one and one-half inches or less in length, lanceolate or ovate, on petioles a third or a fourth their length; the dark margins coarsely irregularly and bluntly serrate; pubescence of the leaves dense, finely stellate, with some coarser three-rayed hairs beneath, and some coarser simple or branched tuberculate hairs above: inflorescences axillary, not equalling the leaves; peduncles densely fine-stellate: involucral leaves five, subulate, a third as long as the calyx: calyx two to three lines high, five-parted two-thirds of the way to the base, the segments lanceolate, stellate-pubescent: corolla barely half an inch across, yellow or reddish, sparingly covered with coarse stellate hairs: stamineal column shorter than the corolla: capsule four lines broad, densely hispid, the sharp angles strongly ciliate.—Collected in waste places near Mazatlan by W. G. Wright, January, 1889 (no. 1,241); and near a pool on Isla Piedra, Mazatlan, by Mr. Lamb, January 2, 1895 (no. 374).

Triumfetta cucullata, n. sp.—A shrub, five to ten feet high: the terete branches sparingly cinereous-pubescent below, densely so above: petioles three-fourths inch or less in length, with four roundish black glands toward the apex; leaf-blade ovate-lanceolate, two to five inches long, three-fourths to two and one-half inches broad, tapering to a subcuneate base and an abruptly acuminate tip; pale, cinereous and stellate below, darker and less pubescent above; margin undulate and irregularly serrate, rarely with scattered dark glands toward the base: corymbs of four to six flowers either single or in fascicles in the axils of the upper leaves or leaf-like bracts: bracts mostly oblong, two to five lines in length, with pubescence and margins like the leaves, but with many round black glands on the margins: peduncles cinereous, one to nine lines long, the longer ones often bearing two or more

corymbs; pedicels three lines or less in length, stellate-pubescent: sepals an inch long, linear, stellate-pubescent without, the tips incurved and cucullate: petals deep yellow, slightly exceeding the calyx, obovate, tapering to ciliate and densely-bearded claws: stamens fifteen to twenty, hirsute below: style exserted.—Collected in the mountains near Zopelote, Tepic, at 2,000 to 3,000 feet altitude, by Mr. I amb, February 11, 1895 (no. 579).

Ilex Dugesii, n. sp.—Branches stout, covered with smooth minutely tomentulose gray bark; branchlets tomentose: leaves oblong, yellowish green, dull, one and one-half to two and one-half inches in length, eight to eleven lines broad, tapering about equally to the bluntish tip and the tomentose petiole (four lines long), margins strongly revolute, entire or obsoletely dentate; the upper surface puberulent, strongly rugose, with depressed veins; lower surface paler; the veins prominent and fuscous-tomentose: fruit red, axillary, solitary, globose, four lines in diameter; the tomentose pedicel three lines long: calyx with very shallow, strongly ciliated lobes: nutlets four, longitudinally grooved on the back.—Collected at Guanajuato by Prof. A. Dugès, 1891. The Mexican name is "Naranjillo." This species differs from *I. rubra* Wats., to which it is evidently related, in its more oblong relatively narrow entire leaves, which are strongly rugose and very pubescent beneath.

Gliricidia Lambii, n. sp.—A tree fifteen to twenty-five feet in height, the smooth trunk about eight inches through· branches minutely pubescent and warty or glabrate: leaves (at the time of flowering confined to the lowest branches) seven or eight inches long, 7-foliate, the rachis sparingly appressed-silky: the petiolule two to three lines long, fuscous-pubescent and hispid; leaflets two and one-half to three inches long, ovate-oblong, or the terminal nearly orbicular, tapering to an obtuse tip, glabrous on both sides, or minutely appressed-silky on the pale lower surface: racemes clustered on the naked branches giving the appearance of compound racemes two feet long; the true racemes two to four inches long, many-flowered; peduncle appressed-pubescent, viscid, fuscous toward the base; pedicels half inch in length, subtended by suborbicular fuscous-pubescent ciliate bracts (a line long): calyx subtruncate, dorsally saccate, appressed silky, three and one-half lines high, five lines broad; the teeth broad and ciliate: corolla pale blue fading with age;

the standard yellow below, suborbicular with a cordate base, and with two oblong callosities above the claw, retuse and ciliate above, an inch long, ten lines broad; wings broadly oblanceolate, eleven lines long by four and one-half lines wide, semihastate above the long claw; keel oblong, eleven lines long, two and three-fourths lines broad: vexillary stamen free, the other nine connate into a tube: style minutely granular below the stigmatic tip; ovary glabrous.—Collected in the valley of Rio Rosario, Rosario, Sinaloa, by Mr. Lamb, January 12, 1895 (no. 451), also observed at Acaponeta, Tepic, and often along the stage road between Rosario and Santiago. The tree is called "Cacaguananchi" by the Mexicans.

CÆSALPINIA CACALACO Humb. & Bonpl. Pl. Æquin. **2**: 173. *pl. 137.*

This species is described as having the leaves unarmed. Though Mr. Lamb's no. 363 from Ocean Beach, near Mazatlan, agrees well with the description and the plate, one of the leaves (in the specimen at hand) has stout recurved spines scattered along the rachis, the remaining leaves being unarmed.

Lagascea glandulosa, n. sp.—Slender, lax, branching from near the base, two to six feet high: the stems densely white-villous above, more sparingly so below: leaves apparently all opposite, ovate, acuminate, one to three inches long, pale beneath, finely soft-pubescent on both sides, entire, ciliate, on slender pubescent petioles three to eight lines in length: peduncles an inch or so long, lanate-villous, and often glandular: glomerule about 15-headed, subtended by two to five linear-lanceolate glandular-ciliate bracts: involucre three and one-half lines high, cylindrical and villous for half its length, then spreading into five narrowly deltoid glandular teeth: corolla yellow, viscid, twice the length of the involucre, the five lanceolate lobes acute: achene pubescent.—Collected at the head of Mazatlan River, by W. G. Wright, in January, 1889 (no. 1,305); and in thickets along the road from Rosario to Chile, Sinaloa, by Mr. Lamb, January 16 to 20, 1895 (no. 483). Resembling *L. decipiens*, Hemsl., but differing from that species in its more slender habit, thin, soft-pubescent leaves on very slender petioles, broader, more spreading and glandular involucral teeth, and pubescent achenes.

Calea submembranacea, n. sp.—Suffrutescent, five or six feet high, the many-grooved branches sparingly villous: leaves submembranaceous, on petioles a line or so long, oblong-lanceolate, subcordate at base, attenuated to a subapiculate tip, smooth and shining on both surfaces, or sparingly villous on the veins beneath, entire, or with a few scattered teeth; the largest three and one-half inches long: heads four to six in terminal or lateral corymbs; the peduncles and pedicels villous-lanate: involucral scales lanceolate, in four or five series; the outer short series villous, ciliate, and obtuse; the inner longer series becoming glabrate, or merely ciliate, acutish: flowers strongly pubescent below; rays about twenty, oblong, whitish, with about seven dark nerves, three-toothed at the tip; disk-flowers many: pappus scales fifteen to twenty, linear-subulate, ciliate-erose on the margins; achenes subtetragonal, hirsute.—Collected on a mountain side at Zopelote, Tepic, at 3,000 feet altitude, by Mr. Lamb, February 9, 1895 (no. 554). In habit closely resembling *C. scabrifolia* Benth. & Hook., but well distinguished by the thinner glabrous leaves, villous stem, and hirsute achenes.

Ipomœa amplexicaulis, n. sp.—A very slender vine, climbing over bushes to the height of ten or twelve feet: stems sparingly hispid or glabrate: leaves remote, an inch and a half long or less, glaucous, on very short petioles (two-thirds line), ovate, cordate, with rounded base and deep closed sinus, round or blunt at the tip; the veins conspicuous, especially below, and the mid-vein continued into a brown cusp: peduncles axillary, two or three inches long, bearing cymes of five to ten light yellow flowers; bracts of the inflorescence lance-subulate, a line long; pedicels two or three lines long: calyx two lines high; the teeth lanceolate, with whitish scarious margins, and covered with brown dots: corolla hardly an inch long, broadly cylindrical for two-thirds of its length and then gradually spreading to a limb half an inch or so across: stamens unequal, about half the length of the corolla-tube: style filiform; capsule obovate, three lines high.—Collected at 2,000 to 3,000 feet altitude in the mountains near Zopelote, Tepic, by Mr. Lamb, February 12, 1895 (no. 576).

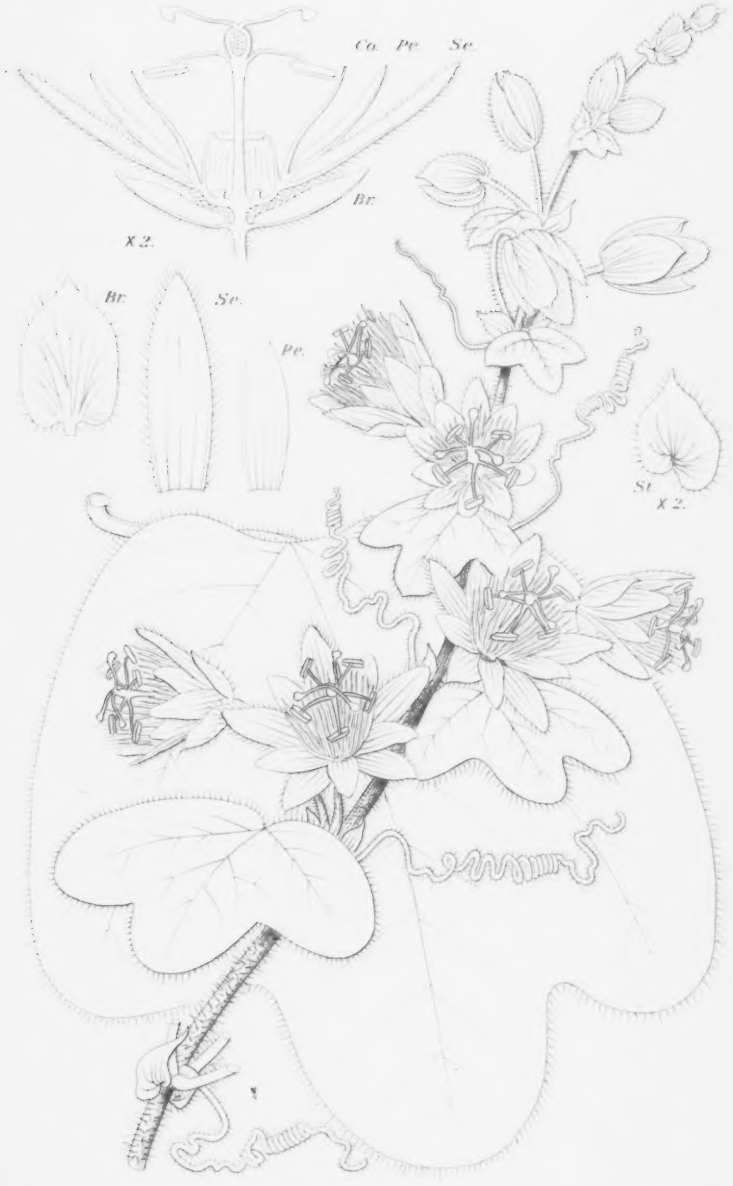
Ipomœa Lambii, n. sp.—A slender vine, climbing fifteen feet over bushes and trees: the stem and branches covered with strongly reflexed tuberculate hairs: leaves broadly ovate, acuminate, varying in length from three to seven inches, two-thirds as broad as long; somewhat 3-lobed, or subhastate,

strongly pubescent beneath, and sparingly above, with ascending tuberculate hairs; petiole two-thirds as long as the blade, densely covered with reflexed hairs: peduncles two to four inches long, sparingly appressed-pubescent, bearing two to four large flowers: calyx about an inch long; sepals ovate-lanceolate, the outer much larger than the inner: corolla rose-purple, three to three and one-half inches high, three to four inches broad when expanded: style exceeding the unequal stamens and reaching nearly to the throat of the corolla.—Collected near Zopelote, Tepic, at 2,000 feet altitude, by Mr. Lamb, February 10, 1895 (no. 556).

Solanum (Polymeris) Lambii, n. sp.—A stiff vine climbing ten feet over bushes: branches subterete, geniculate, densely stellate-pubescent above: leaves solitary or geminate and unequal above, an inch or two long, broadly ovate or reniform with blunt or rounded tips and cordate bases, densely white-stellate beneath, fuscous-stellate above, especially on the veins; petioles two to seven lines long, stellate-pubescent: peduncles stellate-pubescent, two to four, axillary, unequal, none exceeding the leaves, bearing single flowers: calyx subglobose, stellate-pubescent, with ten linear teeth one and one-half to two and one-half lines in length: corolla blue and white, eight lines high, plicate, angulately 5-lobed, externally cinereous-puberulent in bands, the narrow lobes somewhat incurved: anthers oblong, yellow, two and one-half to three lines long, one of them raised on a filament to twice the height of the other four.—Collected at Villa Union, Sinaloa, by Mr. Lamb, January 10, 1895 (no. 446).

Two specimens, one collected at Wartenberg, Huasteca by Ervendberg (no. 126), August–September, 1858; the other by Mr. Hahn in 1865–66 (no station given), may belong here, but they have their leaves tapering at the base.

Carlowrightia glabrata, n. sp.—The slender somewhat woody stem diffusely branched, a foot or two high, villous or glabrate or merely puberulent: leaves one and one-half to two and one-half inches long, tapering below to slender petioles three to four lines in length, and above to cuspidate tips, finely pubescent or glabrate on both surfaces: flowering branches almost naked, arising from the upper axils, somewhat dichotomous, elongated and forming very slender few-flowered spikes three to eight inches in length: calyx-teeth subulate, one and one-half to two lines long, viscid-pubescent, twice as long as the lance-subulate bracts: corolla white or



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PASSIFLORA PORPHYRETICA

purplish, four to five lines long, deeply cleft, and with a short tube (about a line in length): anther-cells narrowly oblong, slightly oblique, one extended a little above the other: capsule four to five lines long, the stipe equalling the ovate laterally compressed body; seed flat, tuberculate-roughened, irregularly cordiform with thickened margins, two lines long, scarcely as wide.—Collected at Manzanillo by Dr. Edward Palmer, December, 1890 (no. 892); and in dry soil under "Mango" trees at Villa Union, Sinaloa, by Mr. Lamb, January 8, 1895 (no. 420).

Henrya grandifolia, n. sp.—Slender, two to four feet high, the branches densely glandular-pubescent above, glabrate below: leaves lance-ovate, three to five inches long, twelve to sixteen costate, tapering above to an acuminate tip, and below to a petiole an inch or so long, appressed-pubescent on both surfaces, sparingly villous on the midrib above; the margin nearly entire, ciliate: the axillary or terminal spikes lax, with a few scattered flowers; the spike generally subtended below by a pair of ovate or orbicular glandular-pubescent leaf-like bracts: bractlets subtending the involucre oblanceolate, one and one-half to two lines long: involucres four and one-half to five lines long, oblanceolate, rounded and often corniculate at the tip: calyx a line high, with lance-subulate teeth: corolla white, three-fourths inch in length: anther-cells elongate-oblong.—Collected at Escuinapa, Sinaloa, by Mr. Lamb, January 29, 1895 (no. 505).

Tillandsia (Platystachys) exserta, n. sp.—Leaves about twenty, rosulate and strongly recurved, deeply canaliculate above, softly white-lepidote on both surfaces; the dilated base broadly lanceolate, an inch long; the blade lance-subulate three to six inches long: peduncle six inches in length: bracts ovate, appressed-imbricated, the lower with subulate leafy tips two to three inches long; the upper with very short tips; all densely white-lepidote: the simple distichous spike two to four inches long, half inch broad, rather densely flowered: flower-bracts lance-ovate, acute, eight to eleven lines long, straw-colored shading into rose at the margins, lepidote, becoming smooth: sepals lance-linear, exserted often half inch beyond the bracts: petals ovate-oblong, violet, half inch long, slightly exceeded by the stamens.—Common on the bushes and trees near Mazatlan, Sinaloa, occurring mostly upon the trees bordering the "esteros" or lagoons. Collected by Mr. Lamb, January 2, 1895 (no. 381).

Cambridge, Mass.

Undescribed plants from Guatemala and other Central American Republics. XVI.

JOHN DONNELL SMITH.

WITH PLATE XXXVI.

Passiflora porphyretica Mast.—(§ DECALOBA). Scandens cirrata, ramulis teretibus setis longiusculis patentibus fulvidis dense vestitis; foliis 5–6^{cm} long. × 3–4^{cm} lat., superioribus gradatim minoribus, crassiusculis superne scabriusculis, infra molliter setuloso-tomentosis, subrotundis palmatim trinerviis, basi breviter cordatis, lobis rotundatis divergentibus ultra medium trilobatis lobis obtusis integris, medio parum longiore; petiolis 25^{mm} long. eglandulosis; stipulis 8–10^{mm} long. oblique ovatis acutis violaceo-purpureis; floribus numerosis secus apices ramulorum racemoso-fasciculatis; pedicellis 2^{cm}; bracteis floribus approximatis circa 1^{cm} long. ovato-oblongis acutis petaloideis violaceo-purpureis; floribus diametro 2–3^{cm} tubo lato expanso; sepalis oblongis 3-nerviis, petalis conformibus paulo brevioribus; corona fauciali univel biseriali filis crassiusculis purpureo-maculatis petalis vix brevioribus; corona media membranacea dimidio breviore erecta tubulata plicata margine anguste inflexa; corona infra mediana annulari crassiuscula; gynandrophoro gracili glabro; ovario ovoideo setuloso; stylis gracilibus. — *Plate XXXVI.*

Species ob stipulas bracteasque coloratas, necnon ob inflorescentiam racemoso-fasciculatum commemorabilis.

Sunny places in forest near Jutiapa, Depart. Jutiapa, Guat., alt. 1,200^{ft}, Apr. 1894, Heyde & Lux, no. 6,334.

Begonia convallariodora C. DC.; erecta glabra foliis modice petiolatis ovato-acuminatis basi inaequali utrinque rotundatis margine subundulatis serrulatisque denticulis breviter subulatis, nervis secundariis utrinque 3–4 e petiolo divaricantibus et 4–5 e nervo centrali penninervatim adscendentibus, inflorescentia cum pedunculo folium fere aequante multiflora, fl. masc. sepalis 2 rotundatis integris petalis 0–1–2 quam sepala multo minoribus staminibus liberis numerosis antheris oblongis cum filamentis fere aequilongis, fl. fem. 2-lobi lobis rotundatis integris stilis 3 bifidis laciniis spiraliter papilli-

feris ovario globoso-elliptico 3-alato ala maxima semilunari.

Caulis in sicco inferne circiter 3^{mm} crassus, fasciculis intramedullaribus nullis. Folia alterna, limbi ad 9^{cm} longi et 5^{cm} lati in sicco membranacei stomatibus ellipticis glomerulatis cystolithis nullis. Petioli circiter 12^{mm} longi. Inflorescentiæ axillaris in vivo niveæ pedunculus circiter 4^{cm} longus ramique ut videtur 2–3-dichotomi, bracteolæ cito deciduæ, flores in vivo Convallariæ odorem fragrantes. Floris masculi sepala circiter 5^{mm} longa, antheræ rimis longitudinalibus dehiscentes. Flores feminei in specimine adhuc juveniles. Capsula ignota.

Species verisimiliter sectionis *Rossmanniæ* A. DC.

Pansamalá forest, Depart. Alta Verapaz, Guat., alt. 3,800^{ft}, Jan. 1886, von Türckheim, no. 840.

Begonia Cooperi C. DC.; foliis breviter petiolatis oblongo-ellipticis uno latere paulo latioribus basi ima parum inaequali acutis subduplicato-serratis, dentibus apice subulatis, supra glabris subtus ad nervos pilosis nervis secundariis rectis utrinque fere 15, inflorescentiæ multifloræ cum pedunculo folium parum superantis ramulis pluries dichotomis cum pedunculo hirsutis, fl. masc. sepalis 2 rotundatis integris glabris antheris ellipticis quam filamenta parum brevioribus, fl. fem. lobis 2 rotundatis integris glabris ovario glabro stilis 3 caducis 2-fidis basi connatis lobis laciniosis spiraliter papilliferis, capsula glabra alis 2 marginiformibus aequalibus tertia multo majore transverse elongata obtusa.

Rami lignosi hirsuti in sicco rubiginosi ad 5^{mm} crassi fasciculis intramedullaribus nullis. Folia alterna penninervia, limbi ad 11^{cm} longi ad 5.5^{cm} lati in sicco firmo-membranacei nervis secundariis cum centrali angulum acutum superne formantibus stomatibus glomerulatis ellipticis cystolithis nullis. Petioli ad 1^{cm} longi. Inflorescentia axillaris pedunculo circiter 8^{cm} longo. Floris masculi petala 0, stamina numerosa libera, antheræ glabræ rimis longitudinalibus dehiscentes connectivo ultra loculos breviter producto. Capsula basi subacuta ad 7^{mm} longa, ala maxima 12^{mm} longa 6^{mm} lata in sicco membranacea pellucida, placentæ 2-fidæ lamellis utrinque ovuliferis.

Species sectionis *Ruizopavoniæ* A. DC. *B. carpinifoliæ* Lieb. proxima ramis hirsutis limbis basi acutis nervorum numero aliisque notis ab ea discrepans, foliorum forma *Corylum ferocem* referens.

Cartago, Prov. Cartago, Costa Rica, alt. 4,250^{ft}, Mch. 1888, Juan J. Cooper, no. 5,778.

Begonia Estrellensis C. DC.; glabra foliis parvis breviter petiolatis ovato-ellipticis basi subæquali obtusis apice acute acuminatis apicem versus serratis penninerviis nervis lateralibus adscendentibus utrinque 3–4, inflorescentia folium parum superante multiflora pauciramosaque floribus parvis, fl. masc. sepalis 2 cum petalis 2 quam sepala multum brevioribus ovatis integrisque staminibus liberis numerosis antheris oblongis filamenta brevissima multum superantibus connectivo ultra loculos producto, fl. fem. 2–3-lobi lobis ovato-ellipticis integris quorum interno multo minore vel deficiente, stilis 3 basi breviter connatis 2-fidis laciniis tortis spiraliter papilliferis, capsulæ ala maxima transverse et subadscendente subarcuata apiceque subacuta.

Ramuli lignosi nodosi circiter 2^{mm} crassi fasciculis intramedullaribus nullis. Folia alterna, limbi in sicco rigiduli 6.5^{cm} longi 2.5^{cm} lati stomatibus ellipticis 2–5-glomeratis cystolithis nullis. Petioli 5^{mm} longi. Inflorescentia axillaris ex apice pedunculi circiter 2.5^{cm} longi axi unifloro terminati utroque latere circiter ter dichotoma, bracteis bracteolisque cito caducis ellipticis integris. Floris masculi sepala 5^{mm} longa, antheræ rimis longitudinalibus dehiscentes, connectivus apice in sicco rubescens. Capsulæ ad lobos circiter 4^{mm} longæ ala maxima vix 3^{mm} lata aliis margini formibus.

Estrella, Prov. Cartago, Costa Rica, alt. 4,400ft, Apr. 1888, Cooper, no. 5,779.

BEGONIA GUYANENSIS A. DC., var. **glaberrima** C. DC.; foliis exceptis supra parcissime pilosulis glaberrima.

Jiménez, Llanos de Santa Clara, Comarca de Limón, Costa Rica, alt. 650ft, Apr. 1894, J. D. S., no. 4,814.

Begonia Heydei C. DC.; erecta glabra foliis modice petiolatis ovato-lanceolatis basi valde inaequali uno latere auriculatis apice acute acuminatis margine remote et parce denticulatis nervis 7 e petiolo divaricantibus quorum centrali nervulos utrinque 2–3 emittente, inflorescentia pauciflora cum pedunculo quam folium breviore, fl. masc. sepalis 2 cum petalis 2 quam sepala angustioribus ellipticis integris staminibus numerosis antheris ellipticis quam filamenta brevioribus, fl. fem. 3-lobi lobis ellipticis integris stilis 2-fidis basi connatis infra lacinias membranaceo-dilatatis laciniis membranaceis spiraliter papilliferis ovario brevi supra alas acuminato inferne attenuato alis e basi lata lineari-oblongis quarum maxima quam aliæ

obtusæ parum longiore apice arcuato-acuta, capsula matura rotundato-rhomboidali alis angustis.

Caulis in sicco ad 3^{mm} crassus fasciculis intramedullaribus nullis. Folia alterna, limbi 10^{cm} longi 32^{mm} lati in sicco membranacei subpellucidi, stomatibus sparsis ellipticis. Petioli 2.5^{cm} longi. Inflorescentiæ axillaris ut videtur trifloræ pedunculus ad 2^{cm} longus, flores apice pedicellorum bracteolis 2 ellipticis integris fulti. Floris masculi sepala 12^{mm} longa, stamina apice columnæ inserta, antheræ rimis longitudinalibus dehiscentes. Floris feminei petala vix 1^{cm} longa, stili caduci, ovarium 3-loculare, placentæ 2-fidæ lamellis utrinque ovuliferis. Capsula matura circiter 12^{mm} longa lataque.

San Miguel Uspantán, Depart. Quiché, Guat., alt. 8,000^{ft}, Apr. 1892, Heyde & Lux, no. 3,094.

Begonia Luxii C. DC.; foliis mediocribus modice petiolatis transverse ovato-acuminatis basi inaequali cordatis margine serrulatis supra ad paginam subtusque ad nervos pilosulis palmati-6-nerviis, petiolo glabro apice imo subtus fimbriato, inflorescentia florente pauciflora cum pedunculo quam folium breviore fructifera eum paulo superante bracteis caducis ellipticis, fl. masc. sepalis 2 rotundatis cum petalis 2 obovatis integris glabris antheris ellipticis quam filamenta brevioribus, fl. fem. 3-lobi lobis exterioribus rotundatis cum interno ellipticis integris glabris, capsula oblongo-elliptica glabra 2-locularis 2–3-alata alis subaequalibus quarum maxima transverse parum elongata tertia minima vel nulla.

Suffrutex circiter 30^{cm} altus radice fibrosa caule lignoso adulto fistuloso ad nodos tumido inferne inter nodos 3^{mm} crasso. Caulis fasciculi intramedullares in nodis nonnulli. Folia alterna, limbi in sicco tenuiter membranacei pellucidi ad 11^{cm} longi ad 5^{cm} lati stomatibus ellipticis sparsis. Petioli ad 5^{cm} longi in sicco tenues. Inflorescentiæ fructiferæ pedunculus 5^{cm} longus. Floris masculi stamina libera numerosa antheris glabris rimis longitudinalibus dehiscentibus. Floris feminei bracteolæ ovatæ caducæ, stili 3 caduci liberi 2-fidi laciniis spiraliter papilliferis, ovarium 3-loculare, placentæ 2-partitæ lamellis utrinque ovuliferis. Capsula abortu 2-locularis.

San Miguel Uspantán, Depart. Quiché, Guat., alt. 6,000^{ft}, Apr. 1892, Heyde & Lux, no. 3,095.—Volcan de Agua, Depart. Zacatepéquez, Guat., alt. 7,000^{ft}, June 1892, Shannon, no. 3,627.

Begonia Thiemei C. DC.; glabra foliis modice petiolatis oblongis inaequilateris subobliquis margine remote denticulatis in sicco tenuissime membranaceis pellucidis penninerviis nervis lateralibus utrinque circiter 8 tenuissimis subadscendentibus, fl. masc. sepalis 2 obovatis integris petalis 0 antheris filamenta duplo superantibus spathulato-oblongis, fl. fem. 2-lobi lobis reniformi-rotundatis integris stilis 3 liberis 2-fidis laciniis spiraliter papilliferis tortisque ovario 3-loculari, capsula transverse longe alata ala maxima ovata obtusa.

Caulis herbaceus. Folia conferta alterna ad 16^{cm} longa ad 6^{cm} lata in sicco tenuissime membranacea stomatibus sparsis raris magnis ellipticis. Sepala 1^{cm} longa. Capsula elliptica alis membranaceis quarum maxima 16^{mm} intermedia 5^{mm} longa. Placentæ 2-partitæ lamellis utrinque ovuliferis.

San Pedro Sula, Depart. S. Bárbara, Honduras, alt. 800^{ft}, Mch. 1888, Dr. C. Thieme, no. 5,240.

Begonia trichosepala C. DC.; caule repente haud dense piloso e nodis radicante, foliis longe petiolatis ovato-acuminatis basi cordatis margine remote denticulatis supra glabris subtus ad nervos sparse pilosis penninerviis nervis secundariis alternis adscendentibus utrinque 5, inflorescentia pauciflora florente cum pedunculo quam folium breviore, fl. masc. sepalis 2 rotundatis extus in medio longe fimbriatis petalis 2 quam sepala multo minoribus ellipticis glab is integris antheris oblongis obtusis quam filamenta pluries longioribus, fl. fem. stilis caducis capsula glabra 3-alata ala maxima quam aliæ parum longiore transverse elongata obtusa.

Caulis in sicco subcoriaceus 3^{mm} crassus e nodis radicellas fibrosas emittens fasciculis intramedullaribus nullis. Folia alterna, limbi circiter 10^{cm} longi 5^{cm} lati, in sicco tenuiter membranacei subpellucidi stomatibus ellipticis sparsis. Petioli 6.5^{cm} longi. Inflorescentiæ axillaris fructiferæ pedunculus ad 9^{cm} longus pilosus, bracteæ ellipticæ glabræ caducæ, florum pedicelli adpresse et longe pilosi. Stamina numerosa libera toro convexo inserta, antheræ glabræ rimis longitudinalibus dehiscentes connectivo ultra loculos subproducto. Capsula 3-locularis circiter 1^{cm} longa, placentæ 2-fidæ lamellis utrinque ovuliferis.

Pansamalá, Depart. Alta Verapaz, Guat., alt. 3,800^{ft}, Jan. 1887, von Türckheim, no. 225.

Begonia Tuerckheimii C. DC.; foliis magnis longe petiolatis ample reniformibus margine undulatis palmati-9-nerviis

utrinque cum petiolis fulvo-tomentosis dein supra glabratis, pedunculo petiolis longiore cum inflorescentiæ pluries dichotomæ ramulis fulvo-tomentosis, fl. masc. sepalis 2 ellipticis integris extus rufo-pilosis, antheris subobovato-ellipticis quam filamenta usque ad duplo brevioribus connectivo ultra loculos obtuse producto, fl. fem. lobis 4 obovato-ellipticis integris extus parce pilosis, capsula 3-alata alisque pilosis maxima transverse et recte producta caeteris subaequalibus parum latiore.

Folia alterna, limbi in sicco subcoriacei opaci 11^{cm} longi 20^{cm} lati. Petioli circiter 22^{cm} longi. Floris masculi petala 0, stamina toro subconvexo inserta antheris glabris rimis longitudinalibus apice subarcuatis dehiscentibus. Floris feminei lobi circiter 7^{mm} longi 3^{mm} lati. Stili 3 persistentes basi connati apice auriculato-bilobi lobis extus papilliferis, ovarium ellipticum dense pilosulum 3-loculare, placentæ 2-fidæ lamellis utrinque ovuliferis. Capsulæ maturæ ad 11^{mm} longæ ala maxima 6^{mm} lata.

Species *B. pinetorum* A. DC. proxima.

S-sisp, Depart. Alta Verapaz, Guat., alt. $3,500^{ft}$, Febr. 1886, von Türckheim, no. 885.

Macroscepis pleistantha Donnell Smith.—Setis longis patentibus simul et setulis minimis brunneo-vestita. Foial obovata, sin minus rhomboidea, acuminata, basis cordatæ lobis incumbentibus. Pedicelli plurimi pedunculum aequantes, floribus ebracteatis in umbellas globosas densas petiolos vix superantes congestis. Sepala ovata acuminata corollæ fauces superantia, sinu unoquoque glandula instructo. Corollæ extrorsum glabræ et pallidæ tubus ovoideus, limbi supra papillosi et in sicco fusci lobis rotundis. Coronæ squamæ deltoideæ in apice incurvo truncatæ ad basim connatæ. Retinacula oblongo-ellipsoidea, caudiculis subnullis.

Stems stout, their diameters exceeded by the longer hairs, younger parts villose. Leaves $6–9 \times 4–5^{in}$, pale beneath, each surface with short, scattered hairs, nerves and margins pilose. Petioles $1\frac{1}{4}–1\frac{1}{2}^{in}$ long. Peduncles stout, ebracteate. Pedicels $4–6^{l}$ long, equaling linear-lanceolate bractlets. Umbels about $1\frac{1}{2}^{in}$ in diameter. Sepals nearly free, $4\frac{3}{4} \times 3\frac{1}{2}^{l}$, reticulately veined, smooth within; glands minute, cylindrical. Tube of corolla 3^{l} high; limb spreading, 9^{l} in diameter, lobed to the middle. Gynostegium a third shorter than tube of corolla, the staminal scales closing the throat, anthers nearly

destitute of a terminal membrane. Pollinia obovate-ellipsoid, compressed, vertically pendulous. Ovaries smooth, ovoid, attenuately produced, carinate, stigma flat. Follicles not seen.

Moist grounds along river near Mataquescuintla, Depart. S. Rosa, Guat., alt. 4,000ft, Mch. 1894, Heyde & Lux, no. 6,350.

Acalypha Lotsii Donnell Smith.—(§ LEPTOPODÆ Muell. Arg.) Folia ovato-lanceolata in caudam linearem integram producta, basi cordata 5–7-nervia. Spicæ utriusque sexus in ramis non constanter sitæ; spicæ masculinæ inferne laxi-bracteatæ basi bracteis singulis femininis interdum praeditæ, floribus 4–8-nis; spicarum feminarum bracteæ 2–6 dissitæ nonnunquam oppositæ, florentes fere partitæ in segmenta singula terminalia reliquis majora productæ, fructiferæ auctæ laciniis 7–11 elongato-triangularibus usque ad medium inaequaliter incisæ. Calyx 5-partitus. Styli glabri laciniis filiformibus tum pinnato-tum furcato-multifidi.

Shrub 9–12ft high, branches virgate, petioles, nerves and young twigs cano-velutinous, otherwise glabrate. Stipules setaceous, 3–5l long, persistent. Petioles 4–10l long. Leaves $2\frac{1}{2}$–$3\frac{1}{4}$in × 11–13l, serrated, the interior pair of basal nerves nearly half as long as midrib. Male spikes slender, pubescent, with their one fourth as long peduncle added $1\frac{1}{2}$–$2\frac{1}{2}$in long; calyx 4-partite, stamens 8. Female spikes glabrous, chiefly twice exceeded by the capillary (1–2in long) peduncle; bracts 1-flowered, in fruit 4–5l in diameter; segments of calyx ovate, acute, ciliate, divisions of style 8–22; capsules cano-pilose, seeds scarcely punctulate.—Indicated as a new species by Dr. John Lotsy, but the time for its description failed him before leaving the Johns Hopkins University for his post as Subdirector of the Botanical Gardens at Buitenzorg, Java. Closely related to *A. leptopoda* Muell. Arg. *ex char.*

Pansamalá, Depart. Alta Verapaz, Guat., alt. 3,800ft, May 1887, von Türckheim, no. 1,242.—Rio Ocosito, Depart. Quezaltenango, Guat., alt. 250ft, Apr. 1892, J. D. S., no. 2,615.—Azagualpa, Depart. S. Rosa, Guat., alt. 2,000ft, June 1892, Heyde & Lux, no, 3,475.—Jumaytepeque, Depart. S. Rosa, Guat., alt. 3,000ft, Sept. 1892, Heyde & Lux, no. 3,839.

Asplenium Donnell-Smithii H. Christ; fronde valde elongata glabra obscure viridi 45cm longa 8–10cm lata, numerosis (30 quoque latere vel pluribus) pinnis alternis instructa; stipite obscure castaneo laevi; pinnis brevissime, ne vix quidem, petiolatis basi inferiori sensim truncatis, basi su-

periori angulo recto abruptis vel moderate auriculatis 6^{cm} longis basi 8^{mm} ad 1^{cm} latis falcatis horizontaliter patentibus, simpliciter, ad basin rarius furcato-serratis, serratura valde regulari et parallela, dentibus 2^{mm} longis obtusiusculis, pinnis a parte media versus apicem in caudam angustam profunde serratam sensim productis; soris circa 12 quoque latere nervi medii pinnæ, a nervo versus marginem angulo patente (nec valde obliquo) tendentibus, sed dentes marginis non intrantibus latis brunneis sese fere tangentibus parallelis; textura papyraceo-herbacea, nervulis occultis.

Habit of *A. bisectum* Sw., but pinnæ broader (more resembling those of *A. protensum* Schrad.) and not incised-pinnatifid but simply and regularly serrated. Very peculiar by the very close large sori, occupying the undivided part of the pinnæ. Differing from *A. falcatum* and *protensum* by the long cauda of the pinnæ.

Nebáj, Depart. Quiché, Guat., alt. 7,000^{ft}, May 1891, Heyde & Lux, no. 4,678.

ASPLENIUM SHEPHERDI Spreng., var. **bipinnatum** H. Christ.—Differt magnitudine dupla vel tripla typi, pinnis 9^{cm} distantibus, perfecte bipinnatis nec bipinnatifidis, pinnulis pinnarum solutis 1.5 ad 2^{cm} distantibus, margine inferiori decurrentibus, sed interstitio libero. Infra apicem pinnatifidam pinnæ adsunt circiter 8 harum pinnularum solutarum quoque latere.

Volcan Tecuamburro, Depart. S. Rosa, Guat., alt. 6,000^{ft}, Febr. 1893, Heyde & Lux, no. 4,680.

Nephrodium nigrovenium H. Christ, (§ LASTRÆA); stipitibus pluribus ex apice caudicis oriundis (æque ac in *N. contermino* Desv.) 18^{cm} longis debilibus stramineis, cum rachi pilis subulatis nigris 2 ad 3^{mm} longis vestitis; fronde herbacea glabra obscure viridi infra vix pallidiore triangulari-deltoidea 30^{cm} longa basi 8^{cm} lata versus apicem decrescente, infra apicem pinnatifidam 12 pinnis oppositis quoque latere instructa; pinnis infimis 9^{cm} longis 3^{cm} latis sessilibus lanceolatis acuminatis, in apicem subcaudatam productis, infra proxime versus nervum nigrum, sed non ad nervum ipsum incisis, supra ala mediali 3^{mm} lata remanente; lobis ligulato-falcatis 5^{mm} latis sese fere tangentibus manifeste et regulariter serrato-dentatis acutiusculis, nervulis quoque latere circiter 8 ad 10 distinctis, nigris,

simplicibus haud furcatis; soris circa 8 quoque latere exacte mediis inter nervum medialem et marginem lobi nervulis insidentibus, flavescentibus, minutis, 0.5^{mm} latis, indusio nimius fugaci.

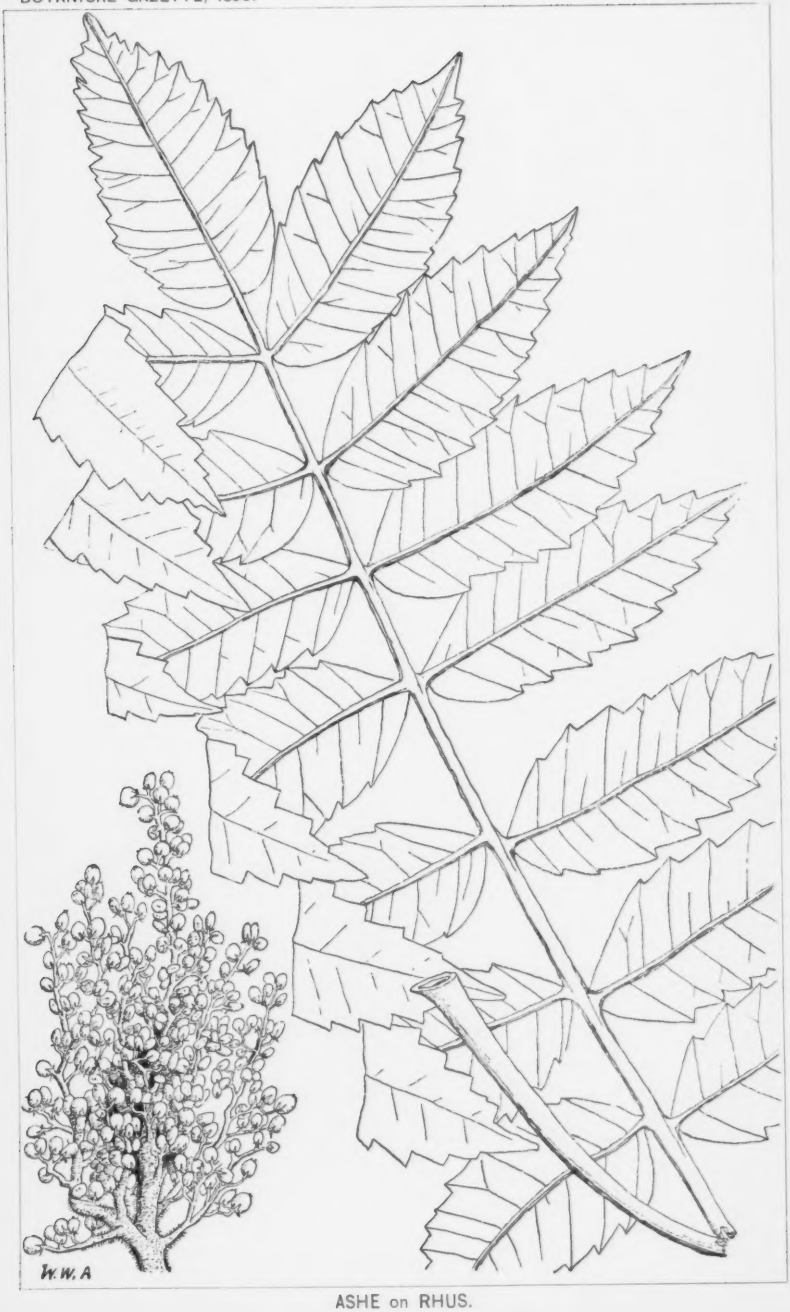
A very peculiar species, well distinguished by its feeble size, deltoid shape, black venation and scales of the stipe, regularly denticulated large segments.

San Pedro Sula, Depart. S. Bárbara, Honduras, alt. 1,000^{ft}, Sept. 1887, C. Thieme, no. 5,646.

Baltimore, Md.

Explanation of Plate XXXVI.

Passiflora porphyretica Mast.—Ramuli floriferi cacumen, et folium magnitudine naturali. Stipula, bractea, sepalum, petalum, necnon flos in sectione mediana verticali visus bis aucti.



ASHE on RHUS.

BRIEFER ARTICLES.

Mimicry of fungi in insects.—It has long been known to botanists as well as entomologists that certain butterflies belonging to the genus Kallima, although the upper surface of their wings is brilliantly colored, have the under surface of a dull gray or grayish-brown color. A large species often seen in museums, *Kallima Inachis*, always excites admiration when mounted with the wings expanded, from the beautiful and intense blue color of the upper surface. When specimens of this species are mounted so as to show the insect resting on a twig with the wings closely overlapping, the resemblance to a dead leaf attached to the twig is something astonishing. The color is precisely that of a dead leaf and the outline is that of a leaf, for at the lower angle of the wings, they are suddenly narrowed so as to form, in the resting position, a remarkable resemblance to a petiole. Although this mimicry of a leaf is well known, I do not remember to have seen it stated that the mimicry is carried still farther. Recently I was shown some specimens of *Kallima Inachis* from India which had been mounted on plaster by Mr. W. D. Denton. To show how great is the resemblance to a leaf I may say that the first tablet shown was only a few feet from me and I innocently asked why a leaf was mounted with the butterfly; whether it was intended to show the plant it lived upon. To my mortification Mr. Denton said that there was no leaf there; that the tablet showed only the insect in its expanded and its resting postures. On examining the insect more closely, I noticed that the "leaf" appeared to be attacked by a species of *Meliola* and, on turning the specimen so that the light fell obliquely upon it, I noticed patches of a dull olive green color resembling closely the appearance of a leaf on which is growing the young stage of a *Strigula*. In short, the mimicry was carried so far that there was not only an admirable imitation of a leaf but also a mimicry of the parasites which infest leaves in a region like that of which the Kallima is a native. On comparing several specimens, one could see that the spots which mimicked parasites were not identical on different individuals but, while there was a general similarity in all, there was just such a diversity in the disposition and intensity of the spots as one would have expected if he had had before him real leaves attacked by parasites like *Meliola* and *Strigula*. Mr. Scudder informs me that entomologists had noticed the spots on the lower surface of the wings of Kallima and also the fact that their position varied with the individual.

Naturally it would not occur to them as it would to a mycologist that, in this case, the spots represented a case of mimicry carried, one would suppose, to the highest degree of perfection; for, not only is the whole insect remarkably like a leaf, but, to complete the deception, it is spotted with parasites irregularly distributed precisely like those on real leaves. In the specimens I saw it required no exercise of the imagination to interpret the meaning of the spots, but any person accustomed to examine tropical foliicolous parasites would have been struck immediately with the resemblance.—W. G. FARLOW, *Cambridge, Mass.*

Notes on the sumacs.—**Rhus Caroliniana**, sp. nov. Low but erect, ten to eighteen inches high, with somewhat glaucous branches: petioles terete and smooth; leaflets thirteen to seventeen, oval to oblong-lanceolate, coarsely and irregularly serrate, green above, pale beneath but not glaucous, two to three inches long: flowers polygamous in a close terminal thyrsoid panicle which is broadly ovate in outline, four to six inches long, the lower branches soft villous, otherwise smooth: drupe discoid, clothed with short red hairs, with a smooth stone.—Flowers in the latter part of May and the acid berries ripen in September.—*Plate XXXVII.*

This species was found in the early part of the present summer in middle North Carolina, growing in old fields and low woods. It seems to be decidedly rare and local and in this state has a very limited distribution. It is most closely allied to *R. glabra*, from which it is at once distinguished by the larger leaflets, fewer in number, and the absence of the glaucous-like whitening beneath. The panicle is broad and spreading while that of *R. glabra* is more narrow. *R. Caroliniana* occurs with *R. glabra* and *R. copallina* but attains only a low growth.

It may be of interest to know that *Rhus pumila* Michx. was collected during the past summer in western North Carolina. Chapman's Flora of the Southern States gives the habitat of this species as "pine-barrens, from North Carolina to Georgia." I can find no record, however, of its having been collected in this section and, as I have failed to find it there after a careful examination, have concluded it was an error. The description as given by Dr. Chapman is very good, though the lower limit of the number of leaflets is probably nine instead of eleven. Pursh in his Flora of North America, correctly gives the plant as occurring in "upper Carolina." It was from this section that John Lyon collected the plants which grew in his garden and from which Pursh made his description. This description is similar to that in Chapman's Flora except that the number of the leaflets is not defin-

itely limited, merely stated to be "foliis pinnatis multijugis." Lyon avers that he was severely poisoned by handling the plant but it must have been by another plant or he was hypersensitive to rhus poisons. Negro children where *R. pumila* grows eat its berries with the same avidity as those of *R. glabra* or *R. copallina* and experience no symptoms of poisoning.—WILLIAM WILLARD ASHE, *North Carolina Geological Survey.*

Note on Aster.— In the region round about Oberlin, Ohio, the descriptions of *Aster corymbosus* and *Aster macrophyllus*, as given by Dr. Gray, do not hold. They run into each other so decidedly as to make the separation of the two into species of no account. Specimens gathered here in abundance show all grades of combinations between the two, making no end of hybrids.

For instance, the distinction of "leaves thin," and "leaves thickish and rough" does not hold at all. We have specimens with the leaves thin and smooth which can be placed only as macrophyllus. Nor will the differences as to serration hold at all. And this is true of specimens from other regions than northern Ohio. Taper-pointed and abruptly pointed would seem to be good distinctions, but will not hold good. Moreover the times of blooming are such that the two can be seen together side by side, part fulfilling the descriptions of corymbosus and part answering to macrophyllus. No wonder Dr. Gray's diaries show that he was nearly distracted with his Asters.—F. D. KELSEY, *Oberlin, Ohio.*

EDITORIAL.

WITH THIS NUMBER the GAZETTE completes its second decade. Beginning in a very small way, with no assurance of success or special reason for it, it seemed to meet a current need and American botanists accepted it as a convenience. Its birth happened to be timely, for it was just before what may be styled the renascence of American botany, and it shared in the development of its subject. As a consequence, it has become not merely a convenience but a necessity to American botanists. Looking through its twenty volumes one sees that all our botanists have written for it, from Gray and Engelmann down through the lengthening and still living list. It therefore represents well the history of American botany for twenty years. At first finding it difficult to fill its few pages with worthy material, its recent large volumes have been kept within bounds only by careful selection. At first necessarily confined to the region of systematic botany, it seeks now to represent all the multiplying fields of work.

ONE UNFORTUNATE THING in the history of the GAZETTE has been the unavoidable changes in the office of publication. From Hanover to Crawfordsville, Bloomington, and now Madison, it represents the usual shiftings in the experience of western college men, and seems to deserve the characterization of "this migratory publication" given by Jackson in his "Guide," who, by the way, confused places of printing with offices of publication. But it has been fortunate enough in its long continued editorial service to offset the change in its local habitation, and to give it that consistent purpose which makes for development. It has sometimes been remarked that in this development the more formal papers have crowded out those small notes and scraps of information which made the older numbers interesting and useful to many. If this be true, it has come about through failure to receive such material even with constant urging. The departments of "Briefer Articles," "Open Letters," and "Notes and News," all have in view such items as once constituted the whole of the GAZETTE. We have heard that, as a rule, botanists read the GAZETTE in oriental fashion, beginning with the last pages and working through toward the first, and it is far from the intention of its editors to eliminate the more transient and more immediately interesting records of botanical activity.

THIS WRITING is more by way of reminiscence than of promise, but it is proper to refer to the future. In the present condition of botany,

to continue in the same way is to retrograde. The GAZETTE proposes to continue its development with the growth of the science and to be a worthy reflex of botanical activity. This will doubtless involve changes in size, in presentation, perhaps in departments. To maintain a strictly scientific journal of high character as a private enterprise has always proved to be difficult, and the fact that the GAZETTE has maintained itself for twenty years and has developed so rapidly testifies both to the devotion of its editors and to the loyal support of botanists. The editors wish that they could do more for less money, but the botanists whom they serve must be asked to share the financial burden. This will explain the gradual increase in subscription price, an increase not at all commensurate with the increase in the scientific value of the journal.

IN CLOSING its twentieth volume, therefore, the GAZETTE assures its readers that still more vigorous effort to make the journal what it should be will testify to waxing rather than waning strength.

* * *

PAINFUL NEWS has just been received of the death of Mr. M. S. Bebb, our well-known authority on the willows. Mr. Bebb died in San Bernardino, California, whither he had gone only November 2d in hope of recovery. A biographical sketch and portrait will appear later.

CURRENT LITERATURE.

The Seaweeds.

So large a part of our courses in general morphology has to do with the algæ that any handy text concerning them is welcome. The ordinary list of "types" has become somewhat stereotyped in text and illustration, and information concerning a broader range of forms would be very useful to such teachers as are not specializing in the group. Mr. George Murray's new book[1] is designed to fill such a place and should be very helpful. A full introduction gives a historical sketch of our knowledge of the group, the division on the basis of color and the relation of colors to distribution in depth, the relation of light and temperature to distribution, agents of distribution, comparison of the floras of different oceans, littoral and pelagic floras and their relation to the sustenance of marine animals, distribution in time, directions for collection, etc. A rather full bibliography is also a very useful feature. Although this is an "introduction" to the study of algæ, it is evident that the student must bring to it a general knowledge of the morphology and terminology of the group. A curious sequence is used, which is said to be for convenience. The *Phaeophyceæ* are first considered; then the *Chlorophyceæ* and *Diatomaceæ;* then the *Rhodophyceæ;* and finally the *Cyanophyceæ*. The account of the *Rhodophyceæ* is based upon the papers of F. Schmitz, and differs from the ordinary classification. As a rule, the illustrations are clear, and many of them are new; while the eight colored plates give a fairly good idea of the coloration. The title "seaweeds" is to be taken literally, for marine forms are chiefly considered, those of the fresh water being referred to only incidentally. The work will prove useful as a reference book in our laboratories, furnishing collateral reading and new illustrations.

Sand Hills of Nebraska.

In changing the plan of its field work the Division of Botany has wisely selected for study certain peculiar regions which may yield definite results to a biological survey in comparatively brief time and at small expense. Mr. Rydberg's work[1] in the "sand hills" region of Nebraska is a good illustration. This region extends over a wide area

[1] MURRAY, GEORGE.—An introduction to the study of seaweeds. Small 8vo. pp. vii+271. col. pl. 8. figs. 88. London and New York: Macmillan & Co. 1895. $1.75.

in the western part of the state, in fact, its eastern limit reaches the center of the state. The "sand hills" change their configuration constantly, and where not held by roots the sand is gradually carried away by the wind, often transforming bared spots into "blowouts." There are four notable "blowout" grasses, which serve to give such stability as there is to the shifting sands, viz: *Calamovilfa longifolia*, *Redfieldia flexuosa*, *Eragrostis tenuis*, and *Muhlenbergia pungens*. In addition to these species, Mr. Rydberg gives a list of about twenty-five others most characteristic. The survey was practically confined to two counties in the heart of the sand hills. The catalogue of species collected is a long one, and contains many interesting notes and critical remarks. There are also descriptions of new varieties, and a new species of *Carduus* is illustrated by a plate.

The economic possibilities of the region are also considered, and in Mr. Rydberg's judgment the only agricultural hope for this region, as well as the neighboring regions which it helps keep dry, is a covering of forest vegetation, which he believes may be possible.

Minor Notices.

VOLUME II of the *Proceedings* of the Iowa Academy of Sciences covering the meeting in 1894 is the first to be published by the state, and it makes a most creditable showing. It contains 225 pages and 22 plates, well printed and in convenient form. The matter is interesting and valuable. It includes seven papers upon botanical subjects: Effects of heat on the germination of corn and smut, F. C. Stewart; Distribution of some weeds in the United States, L. H. Pammel; Structure of the seed-coats of Polygonaceæ, Emma Sirrine; Lichens collected by Dr. C. C. Parry in Wisconsin and Minnesota in 1848, B. Fink; Pollination of cucurbits, L. H. Pammel and Alice M. Beach; and Diseases of plants at Ames, 1894, L. H. Pammel.

[1] RYDBERG, P. A.—Flora of the sand hills of Nebraska. Contributions from the U. S. Nat. Herbarium. **3**: 133–203. 14 S. 1895.

OPEN LETTERS.

Botany at the A. A. A. S.

Every one, I think, will welcome the new movement to compress all the sessions of the American Association for the Advancement of Science into a single week, thus avoiding the Sunday hiatus; and every one should heed the GAZETTE's advice to attend the meetings, for the mutual good of American botany and of the Association. It will also be a good plan, no doubt, to publish a program of section G some time in advance. There is one feature of this program which should be carefully studied, and that is the nature of the papers which are admitted to it. I do not mean that the committee should exercise any censorship over papers, but simply that very many excellent papers are not of a nature to be read at a public gathering of botanists. Papers of mere technical interest should be published in some medium but sh ›uld not be read. Surely, several of the papers which were read at Springfield were of no interest, save to the author, and yet they were valuable contributions to science and, as such, should have found their way into print without having been presented before section G. A technical article upon Carex, for example, would be intolerable in a general gathering of botanists, and yet it is conceivable that it might be worth putting into print for the delectation of the two or three, or fewer, persons in the country who care anything about the subject.

It should be true of every paper which comes before the section that at least half the members will be interested in the subject and be able to discuss it. Good writings upon any fundamental phenomena or structures of plants, upon philosophical questions, geographical matters, distribution, the latest advances and methods, and a score of other subjects, will always arouse interest and do good. Let the papers have breadth and life in them, and the meetings will abound in enthusiasm.—L. H. BAILEY, *Ithaca, N. Y.*

Botanical terminology.

In the October number of the *Bulletin* of the Torrey Botanical Club a new phase of its tendency to innovation appears, indicating that changes similar to those in botanical nomenclature are also to be made in botanical terminology.

Mr. Nash, in an article upon new or noteworthy American grasses, has changed the definite and well-known terms, "glume" and "palet," to the very loose and indefinite word "scale," and uses this freely in the diagnoses. Instead of the old terms, "empty glumes," "flowering glume" and "palet," Mr. Nash designates these organs as "outer or inner scales," or "scale 1, 2, 3, 4, etc."

We venture to ask whether there is really any reason for making such change, since these organs have always been known as the glumes and the palet. It seems very surprising indeed that Mr. Nash in describing grasses has not been aware of the morphological dissimilarity

of these organs. The term "scale" is used to designate the flat imbricate bracts in inflorescences of various families, e. g., Cyperaceæ, Xylideæ, Compositæ, etc., also the scale-like leaves of underground rhizomes in general, various nectaries, the lodiculi of grasses, etc.: but the carinate glumes and the bicarinate palet of the grasses have so far not been called scales, since their shape as a rule is too different, and the indiscriminate use of this term could lead only to confusion.

It would be highly desirable if the Torrey *Bulletin* would compel its contributors to conform to the well-known terminology of scientific botany. If not, the terminology of American botany will soon become as chaotic as its nomenclature.—THEO. HOLM, *Washington, D. C.*

NOTES AND NEWS.

DR. H. BAILLON died suddenly in Paris on the 18th of July in his 68th year.

THE LINNEAN SOCIETY'S gold medal has this year been awarded to Prof. Dr. Ferdinand Cohn of Breslau.

DR. J. VESQUE, the eminent French botanist, died at Vincennes near Paris on the 25th of July in his 47th year.

MR. JOHN DONNELL SMITH intends leaving Baltimore early in January for a visit to Nicaragua in order to continue his researches on the Central American flora.

IN HIS series of papers, in *Journal de Botanique*, on new plants of western China, M. A. Frauchet has just described twenty-one new species of *Rhododendron*.

KALMIA CUNEATA, lost after Michaux's original discovery, rediscovered by Mr. W. W. Ashe, of the Geological Survey of North Carolina, is fully described in *Garden and Forest* (Oct. 30).

DR. S. NAWASCHIN announces that *Juglans cinerea* affords a new instance of chalazal fertilization and must therefore, with Casuarineæ and Betulaceæ, be ranked among the Chalazogamæ.—Bot. Cent. 53: 353. 25 S. 1895.

DR. FELIX HOPPE-SEYLER, professor of physiological chemistry in the University of Strassburg, died on August 11th, at the age of 70 years. He did much to advance the knowledge of vegetable physiology upon the chemical side.

THE DIVISION OF FORESTRY has reprinted in pamphlet form, from the last Yearbook of the Department, Mr. Fernow's paper entitled "Forestry for farmers." It will be of great service to all those interested in the proper handling of forests.

THE SPECIAL APPARATUS for bacteriological sampling of well waters described by Prof. H. L. Bolley in a paper before the Botanical Club of the A. A. A. S., in August last, is illustrated, and the paper given in full in the *Amer. Micros. Journal* for October.

MR. N. M. GLATFELTER discusses *Salix Wardi* Bebb in *Science* (Nov. 1). He has had extensive field experience with it and gives additional information as to its relationships and range. A careful tabulated comparison with *S. nigra* and *S. amygdaloides* sets out the species strongly.

THE SIXTH, seventh and eighth issues of Lloyd's "Photogravures of American Fungi" comprise Coprinus comatus, showing young and old plants; Crucibulum vulgare, growing on a piece of rotten straw mat; and Urnula Craterium on fallen limb. The high quality of the former issues is maintained.

IN CONTINUING his studies of the African *Asclepiadaceæ*, appearing in the *Journal of Botany*, Mr. R. Schlechter has described (Nov.) two more new genera, *Symphytonema* and *Glossostelma*, both illustrated. He also describes seven new species, and follows Baillon in merging *Gomphocarpus* with *Asclepias*.

WEED BULLETINS have been issued by the Experiment Stations of Kansas (no. 52), giving a list and distribution over the state by counties; of Ohio (no. 59) giving methods for destruction of weeds along roadsides; and of Iowa (no. 28 in part) giving an account of prickly lettuce (Lactuca scariola) and buffalo-bur (Solanum rostratum).

THE CONTRIBUTIONS to the Queensland (Australian) flora, by F. M. Bailey, the colonial botanist, has now reached the eleventh number. The last issue (dated July, 1895), contains descriptions of the freshwater algæ, about ninety species, and of the marine algæ, about twenty species, with very full notes, and seventeen plates of illustrations.

THE BOTANIC GARDEN at the Agricultural College of Michigan is pleasantly described by Professor Beal in *Garden and Forest* (8: 303 and 322). The garden covers three acres, and, although most of the work is done by one man, yet it contains many interesting features, and is one of the few notable botanic gardens of the United States.

THE SUGGESTION has been made that the University of Pennsylvania, in connection with the museum buildings which are contemplated, lay out an ethno-botanic garden which shall serve for the instruction of the public as to aboriginal American plants, and shall possess, also, scientific value by reason of its rarity.—*Phila. Evening Telegraph.*

PROFESSOR H. HELLRIEGEL, director of the Agricultural Experiment Station, died at Bernberg, Germany, on Sept. 4th, at the age of 64 years. His investigations upon the fixation of nitrogen by Leguminosæ, and allied subjects, are of the highest value. Probably his best known work is "Untersuchungen über die Stickstoffnahrung der Gramineen und Leguminoseen," published in connection with Dr. H. Wilfarth in 1888.

IN THE *Annuario del R. Instituo Botanico di Roma*, which is edited by Professor Pirotta, the sixth volume opens with the following papers: The formation of the starch grain, by C. Acqua; The germination and certain structures of *Keteleeria Fortunei* (a coniferous plant), by Pirotta; Some plants new to the Roman flora, E. Chiovenda; Contribu-

tions to the flora of eastern Africa, by C. Avetta, a list of 202 species, several of which are new.

In *Flora* (80: 303) Herr H. Glück combats Bower's theory of the sporophyte being derived by the sterilization of sporogenous tissue. The point taken up is the foliage leaf of pteridophytes, which, Glück maintains, has nothing whatever in common with the sporogonium of mosses.

Under the title "Education and research in agriculture in the United States," the U. S. Department of Agriculture has published a pamphlet of thirty-six pages, prepared by Mr. A. C. True, giving a clear historical account of the beginnings, advancement and present status of the higher intellectual forms of agricultural knowledge.

Dr. Chapman's herbarium of southern plants, upon which is based his *Flora of the Southern States*, has been purchased by Mr. George W. Vanderbilt, and will serve as a nucleus of the scientific collections which he is establishing on his estate at Biltmore, in North Carolina, in connection with an arboretum and systematically managed forest. —*Garden and Forest.*

M. Vuillemin has described some very curious ovules of *Begonia erecta*. They "are transformed into organs, the upper part of which has the color and structure of petals, the lower part the essential structure of a carpel" (*Jour. Roy. Micr. Soc.*). He seems to think that such a monstrosity shows that there is no essential difference between an axial and an appendicular organ.

A European botanist, whose plant preparations are known everywhere, is upon the point of losing his eyesight, this misfortune rendering him absolutely helpless. European journals have been interesting themselves in his case, and the Botanical Gazette is glad to present this notice to its readers and to act as a channel of communication for American botanists who desire to help in this case.

The energy of the living protoplasm is treated in a series of most interesting and comprehensive articles by Dr. Oscar Loew, professor of agricultural chemistry in the Imperial University of Japan, which are now appearing in the *Bulletin* of the College of Agriculture. They are written in English. The same publication contains many other articles upon chemico-physiological subjects, for the most part the result of original investigations.

Grape diseases of the Pacific Coast are treated by Newton B. Pierce in Farmer's Bulletin no. 30 from the U. S. Department of Agriculture (pp. 8, figs. 3). The diseases described are "California vine disease," known since 1884, devastated 30,000 acres of vineyards and caused a loss of $20,000,000, the powdery mildew, known since 1860 and coulure. The last causes the flowers and fruit to fall from the bunches, and is due to a variety of causes.

In *Bulletin de l' Herbier Boissier* (Oct.), J. Freyn discusses a group of oriental Hieraciums; Nicolas Alboff gives the results of an extended study of the alpine flora of the limestones of the western Transcau-

casus, a peculiar and uniform region fully deserving careful biological observation; R. Chodat describes twelve new species of South American Polygalaceæ, two of which form a new subgenus (*Monninopsis*) of *Monnina;* and Olga Tchouproff discusses the anatomy of *Acanthaceæ.*

THE BULLETIN of the botanical department of the Public Gardens of Jamaica, published at Kingston, contains much valuable information to tropical cultivators and others interested in tropical vegetation. The number for September discusses the essential oils of orange, cultivation of cocoa and cocoa-nut, and other economic topics. It also includes a continuation of the synoptical list of Jamaica ferns, four species of Aspidium being treated.

A BRONZE BUST of Robert Brown has been placed as a memorial "in a niche in front of the house in which he was born," at Montrose. The bust is the gift of Miss Paton, a kinswoman of Robert Brown. The reputation of this botanist was almost unique, the foundation for it being laid in his four years of exploration in Australia, and the wealth of strange types that fell to his lot to study. Several botanists made addresses at the unveiling, and all testified "to the great work of the greatest British botanist."—*Gardener's Chronicle* (Oct. 26).

BULLETINS HAVE BEEN ISSUED from the Experiment Stations upon the following subjects: Poisoning from cowbane, by L. H. Pammel (Iowa no. 29 in part), an excellent account of the effects upon man and the domestic animals of eating the fleshy roots of Cicuta maculata; Crimson clover and other topics, by A. A. Crozier (Mich. no. 125), largely treated from the cultivator's standpoint; Native trees and shrubs, by Thos. A. Williams (S. D. no. 43), enumerates 117 ligneous plants and gives a brief description and the distribution over the state.

DR. J. W. HARSHBERGER has in preparation an account of the botanists of Philadelphia and their work, to show that American botany owes much to Philadelphians for its full development. The book will be an impartial discussion of the work of Philadelphia botanists. It will consist of an historical introduction, describing the rise and progress of botany in and near Philadelphia, to be followed by biographical sketches of those botanists who have prominently molded botanical thought as collectors or investigators. Portraits of all botanists included will appear. Any who can contribute any information about Philadelphia botanists are requested to communicate with the author.

BY INCREASING THE AMOUNT of nourishment Kenjiro Fujii (*Tokyo Bot. Mag.* 9: 271–275) has been able to produce female and hermaphrodite[1] flowers in *Pinus densiflora* which would otherwise have been male flowers. The method is to cut away the end of the shoot, or to remove all side shoots, or both, and thus force most of the store of nourishment into the growth of the flowers. He is led to believe that the sex of the flower is undetermined up to a certain stage of growth, and that it is in part determined by the amount of nourishment. The article is printed in English.

[1] We use the sex terms as in the article, though it must be remembered that they are not really applicable.

In the *Journal of Botany*, for October, Mr. A. B. Rendle continues his description of Elliot's tropical African Orchids; Mr. R. Schlechter begins an enumeration of the Asclepiadaceæ of the same collector, describing a new genus (*Pleurostelma*); and Mr. D. Prain continues his account of the genus Argemone.

The Lemmon herbarium has been removed to a commodious building belonging to Mr. J. G. Lemmon in North Temescal, a beautiful suburb of Oakland, California, on the electric line between that city and Berkeley. Mr. Lemmon's twenty years of familiarity with Pacific coast plants, his large collection, and the library facilities at Oakland, Berkeley, and San Francisco ought to make possible some valuable monographs of western spermaphytes.

In the annual report of the Rhode Island Experiment Station for 1894, L. F. Kinney discusses the fungous parasites of the apple and pear (pp. 183–198), with nineteen well printed illustrations. In the report of the New Jersey Experiment Station for the same year, B. D. Halsted writes upon a variety of subjects (pp. 273–419). Fungicides were tried upon cabbages, tomatoes, potatoes and beans. A large part of the space is devoted to injurious fungi of cultivated plants. Weeds receive some attention, and the poisonous plants of New Jersey are reported upon. Several articles are reprinted from journals. There is abundant illustration, but the cuts are very indifferently printed. Like the former reports of this indefatigable observer and writer, this one contains a large amount of important matter from both the scientific and economic standpoints.

Poisoning of cattle by eating corn stalks, which contained an excessive amount of nitrate of potash, has been reported from Kansas (*Bull. Kans. Exper. Sta. no.* 49). The plants had taken up so much of this substance from the soil, that in the partly dry stalks examined, "beneath the leaf sheath which surrounds the stalk just above the joints the nitrate had crystallized in fine white crystals which resembled a white mold, but was easily recognized by tasting with the tongue. Around and in the cut ends of the stalks were solid masses of almost pure potassium nitrate. If a stalk was cut in two and tapped lightly upon a table, the crystals of potassium nitrate would be jarred loose and fall as a fine powder. Upon splitting a stalk, the crystals in the pith could easily be seen with the unaided eye. On lighting a bit of stalk, it would deflagrate, burning rapidly like the fuse of a fire cracker. A chemical examination gave 18.8 per cent. of the dry weight of the stalk as nitrate of potash." This corn was raised on about one-eighth of an acre, which had for some time previously been used as a hog pasture. The corn had not matured owing to dry weather.

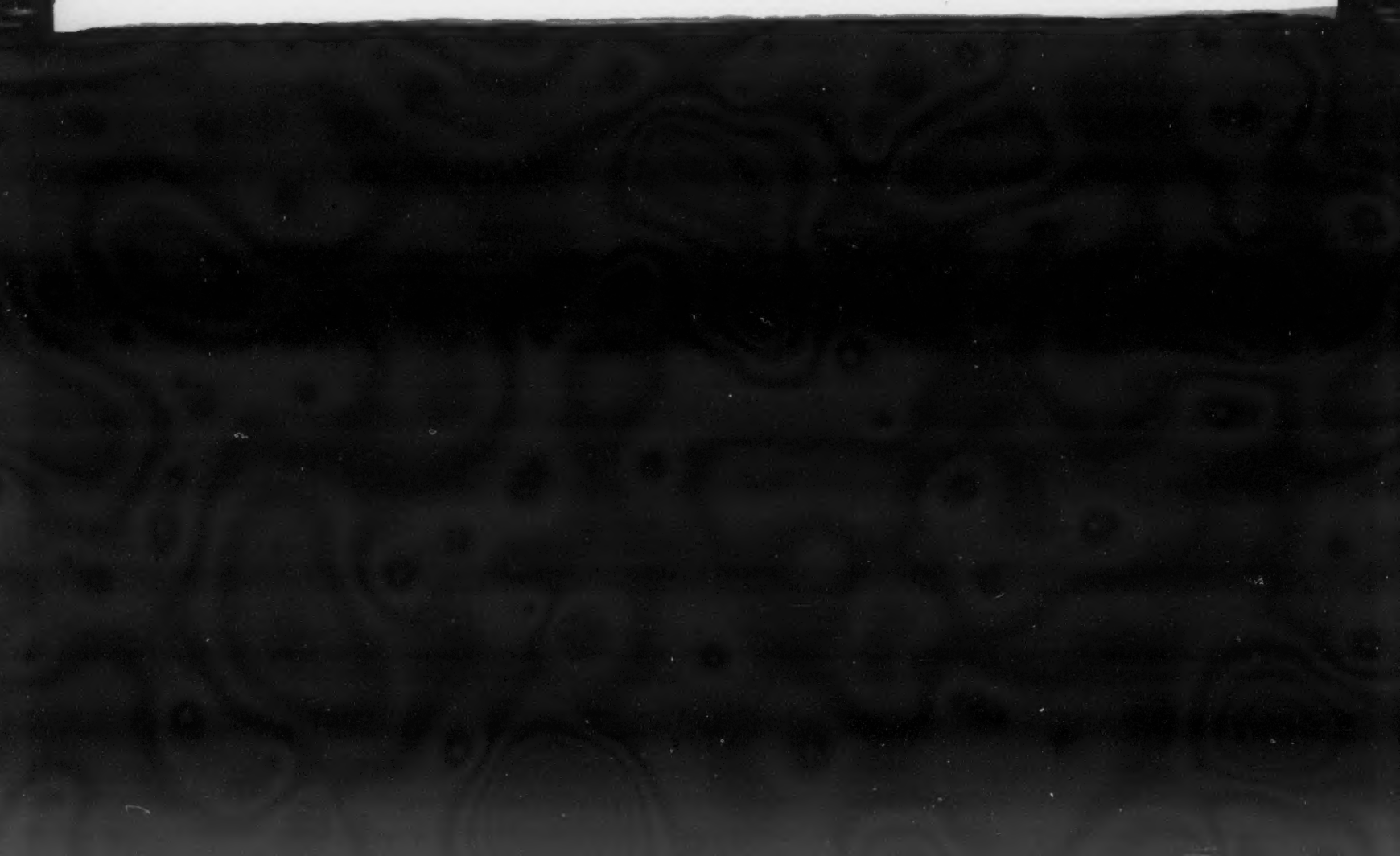
Professor W. C. Williamson died in London on June 23d, at the age of 78 years. He is best known by his series of important memoirs upon paleobotanical subjects, published mostly in the Proceedings of the Royal Society. From 1851 to 1892 he was professor of natural history and geology in Owens College, Manchester. At the latter date he laid aside his collegiate duties and removed to London to devote himself exclusively to his special field of study. Professor

Williamson had a sympathetic and attractive personality, which endeared him to all who had the privilege of his acquaintance. It was while his guests, that the picture, so well known in this country as the Manchester group of botanists, was taken. Beside Professor Williamson, who is in the center of the picture, sits Dr. Asa Gray, and no two men in the group looked more alike, or had more endearing qualities of mind and heart. His home in Manchester looked out at the rear upon an enclosure in which were grown in great thriftiness quite a large number of flowering plants, both for beauty and for botanical interest. A small greenhouse was fairly packed with orchids and other plants. Although a good gardener was employed, the direction of the work and part of the actual labor was carried on by Professor Williamson, who gave much of his leisure time to its care, and obtained from it no small degree of enjoyment.

A notice of his life, and of his contributions to science, written by Prof. L. F. Ward, has been published in *Science* for August 9th.

WHILE MANY plants are known to owe their dissemination to animals, especially birds and insects, only a few have so far been observed to become distributed by snails and toads. Voglino has lately published a very interesting article[1] upon this subject, and he demonstrates the fact that certain fungi (*Agaricineæ*) become distributed by snails and toads. It seems even, according to his observations, as if there is a connection between the occurrence of such fungi in places where these animals abound. It was, at least, the case in some pine woods in Carara and Piedmont in Italy. An examination of the stomach-contents of the snails showed the presence of spores of various species of Tricholoma, Lactarius, Russula, Amanita and others. The spores were observed to have begun their germination while still inclosed in the animal, and a culture of the excrements of various snails produced a large number of germinating spores of these fungi. The same was also observed by examining the stomach-contents of toads, in which, especially, spores of *Russula* and *Lactarius* were abundant. The author supposes that the spores of these fungi obtain the most favorable conditions for their germination by passing through the digestive can alof a snail or a toad, thus their dissemination seems closely connected with the presence of these animals.—T. H.

[1] Voglino, P. Richerche intorno all'azione delle lumache e dei rospi sviluppo di alcuni Agaricini. Nuovo Giornale bot. Ital. Nuova serie. **2**: 181–185. Ap. 1895.



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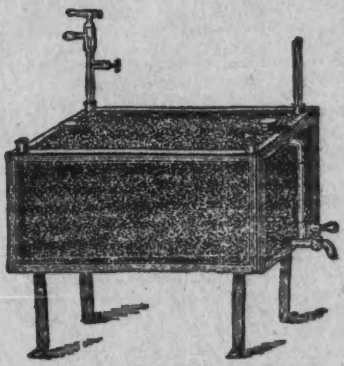

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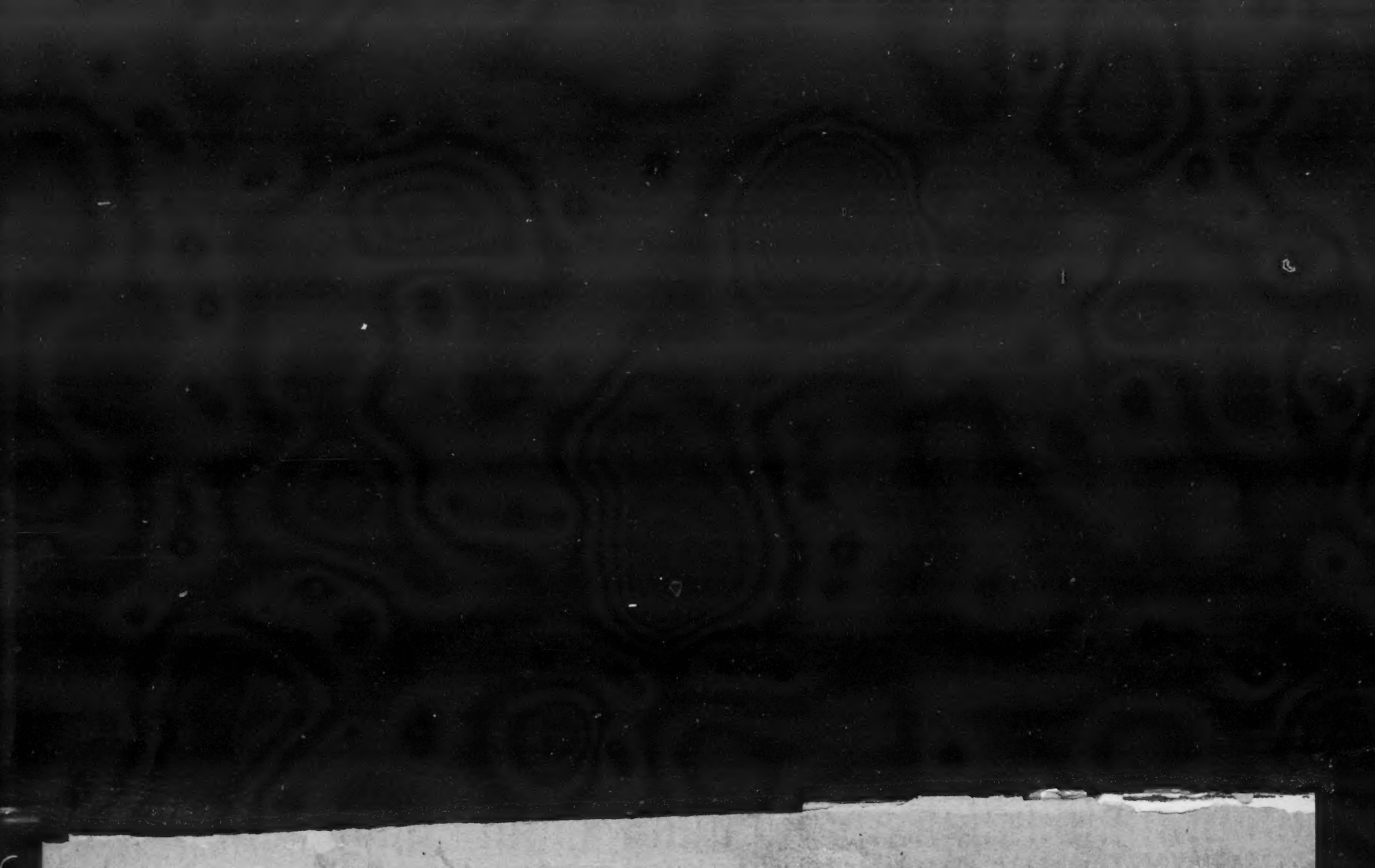
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